Benefits and Costs of Various Options for Meeting CAMR through Control of Mercury from Electrical Generating Units

Executive Summary

This analysis evaluates the benefits and costs of four options for meeting the U.S. Environmental Protection Agency's (EPA's) Clean Air Mercury Rule (CAMR) through the control of mercury (Hg) from Electrical Generating Units (EGUs). Specifically, this analysis compares the benefits and costs of the EPA cap and trade option for meeting CAMR, DEQ's proposed rule, the Montana Board of Environmental Review (BER) "Noticed" rule and the "No Trading" rule. This analysis includes an evaluation of the relative costs of these four available options to meet CAMR. It also compares relative benefits between the four options, but does not provide a quantitative estimate of all the benefits, due to a lack of quantitative data in this area.

The inadequacy of quantitative data available on benefits has a significant impact on the outcomes of this analysis. This analysis incorporates what very limited quantitative data were readily available, but these data represent only a relatively small subset of the larger issue. As such, the benefits of mercury control are likely substantially undervalued in this analysis. It is important to note that the monetary benefit estimates in this paper do not include non-monetary benefits to human health, recreation, ecosystem quality and agriculture that occur from each of the four options for meeting CAMR.

The No Trading rule would result in the greatest costs and benefits from CAMR. EPA's cap and trade rule would result in the least costs and benefits from CAMR. Total costs and benefits from DEQ's proposed option and the Noticed rule would fall somewhere in between, although they would be much closer to the costs and benefits experienced under the No Trading option than those experienced under EPA's cap and trade option. Total monetary costs of CAMR in Montana and cost differences between the four options would likely be significantly greater than total monetary benefits of CAMR and benefit differences. CAMR costs and cost differences between the four options would be significant for some private utilities in Montana that own EGUs. Compared with EPA's cap and trade rule, the other three options likely would cost EGU owners significantly more. CAMR benefits and benefits differences could be significant to humans and the environment. Compared with EPA's cap and trade rule, the other three options would likely result in potentially significant greater benefits on human health and regional ecosystems.

The costs of the mercury rule under all four options, and the additional costs of the three proposed options with hard emissions limits, would fall almost exclusively on Montana EGUs. The estimated range of the cost difference between EPA's cap and trade option and the No trading option is $87 to $168 million over 40 years from 2010-2050 (the EPA's rule costing the least amount). Because most Montana EGUs are owned by out of state corporations, those costs will be borne primarily by out-of-state interests. The owners of the EGUs might pass a small amount of these costs on to electricity consumers

in and outside of Montana, but any electric rate increases to Montanans would likely be insignificant compared to other determinants of electricity price borne over time by ratepayers. Because electricity rates are deregulated, and because of a recent deal between PPL-Montana and Northwestern Energy, most Montana ratepayers would not be expected to bear any increased costs in the form of increased rates as a result of CAMR. Electricity customers of Montana-Dakotas utility in the far eastern part of the state might see a rise in costs due to the coal-fired generation on their system, but it would also likely be insignificant.

Among EGUs in Montana, the owners of Colstrip would bear the vast majority of costs from any of the mercury rules adopted (including additional costs from the three more expensive options), and thus the owners of Colstrip would experience lower profits, all else being equal. The owners of Colstrip would bear significant additional costs as a result of any of the rules, and possibly much higher costs (lower profits) under the three proposed rules with hard emission limits than under EPA's cap and trade rule. The owners of Colstrip are mostly out-of-state companies and include PPL-Montana (an in-state company), Puget Sound Power and Light, Portland General Electric, Avista, Pacific Corp, and Northwestern Energy (an in-state company). The owners of the other affected EGUs in Montana include Colstrip Energy Partnerships and Montana-Dakota Utilities, and these entities could also experience an increase in costs (decrease in profits). No EGUs are expected to close down as a result of any of the proposed mercury rules, nor are any jobs expected to be lost (although some jobs could change through re-training). Implementation and compliance/enforcement costs to the DEQ for the mercury rule would be inconsequential. All activities under any of the four options would be accomplished with existing DEQ staff.

The benefits of the mercury rule would be felt by those who live downwind and near Montana's EGUs—primarily in Central and Eastern Montana, and partially in Wyoming and in the Dakotas. Health costs could go down for affected populations, which is a benefit, but evidence suggests that only a few people would be beneficially affected financially from mercury reductions at Montana EGUs. Overall health would likely improve in the area for a few people, including those not directly affected financially by health care. Ecological cleanup costs might be reduced for affected areas. Fishing advisories might be lifted over time, leading to increased and better quality fishing as well as an insignificantly greater amount of tourist related revenues. Fish, birds and mammals in the mercury deposition area would also experience benefits of fewer toxic mercury episodes.

The difference in benefits between the No Trading and EPA cap and trade options could be as much as 50%. The DEQ, Noticed and No Trading options would result in greater CAMR benefits to Montanans and citizens of other states due to the greater reduction in overall mercury emissions from Montana EGUs under these options. These benefits would include better human health and ecological health (along with other benefits) and could be $28,000 to $218,000 greater per year under No Trade than EPA's cap and trade, not counting the greater non-monetary health and ecological benefits that would also occur under No Trade. Over a 40 years period, using a 5% discount rate, the greater benefits would amount to $0.5 to $3.8 million in monetary benefits to Montana. Non-monetary health and ecological benefits could be substantial from the rule (and much greater than monetary benefits), with differences in benefits between the rules being the greatest between the EPA cap and trade rule (least benefits) and the other three options, with the No Trading option leading to the most benefits. In addition, a Harvard University study paid for by the EPA, co-authored by an EPA scientist and peer-reviewed by two other EPA scientists has concluded that there would be significant health benefits from reductions in mercury emissions. It is possible that the monetary benefit numbers from mercury reduction could increase substantially as more research in this area is performed in the future.

The purpose of the proposed mercury rule is two-fold. The first purpose is merely to meet the minimum requirements of CAMR. As described in the body of the analysis, EPA's default cap and trade rule is the least costly and intrusive method of achieving this purpose of the rule. The other purpose of the proposed rule is to reduce mercury emissions in Montana in order to mitigate potential health and environmental impacts from localized deposition of mercury from EGUs. Because CAMR focuses only on national reductions, it does not guarantee mercury emission reductions in Montana, using the EPA cap and trade model. The DEQ proposed option achieves the rule's purpose by requiring mercury emission reductions from existing and currently permitted EGUs consistent with the EPA's goals for nation-wide reductions. The Noticed rule and No Trading option achieve the rule's purpose by adopting a state-wide mercury emissions cap of 298 lbs. The DEQ proposed alternative, and to a lesser extent the Noticed rule, would be less costly alternatives for achieving the rule's purpose, because allowing trading of allowances could generate revenue to partially offset costs of control, and would be easier on new EGUs entering Montana's market. Thus, from an economic perspective, they represent an efficient allocation of public and private resources.

Appendix A summarizes the information required for this Economic Impact Statement pursuant to Section 2-4-405 (a)-(h), MCA. These requirements include the determination of economic efficiency outlined in the above paragraph.

I. Background

1.1 CAMR

CAMR establishes performance standards for mercury emissions from new coal-fired EGUs and emission guidelines for existing EGUs. Under CAMR, EPA has assigned each state and two tribes a two-phased emissions budget for EGU-based mercury emissions. In Montana's case, this budget is significantly below current emissions. The sum of these state and tribal budgets for each phase of CAMR is the total U.S. mercury emission cap. The U.S. cap is 36 tons (72,000 lbs.) per year starting in 2010 and 15 tons per year (30,000 lbs.) starting in 2018. The current estimated mercury emissions from EGUs are about 50 tons for the U.S.

States must submit plans to EPA detailing how they will reduce mercury emissions from coal-fired EGUs to meet their CAMR budgets. EPA has offered an interstate trading program as an option for states and tribes to attain and maintain the national annual EGU mercury budget and comply with CAMR. This “presumptively approvable” program is a typical “cap and trade program”. Some states, including Montana, are considering alternatives to the cap and trade approach. States may choose to adopt and implement an alternative plan, but if a state chooses to not adopt the default interstate cap and trade program, the state’s EGU mercury budget becomes a hard cap, which cannot be exceeded under any circumstances. A state’s mercury budget can be exceeded through participation in the cap and trade program if the EGUs in that state buy additional mercury allowances on the open market over the initial budget. Mercury allowances are sold on the open market by owners or operators of EGUs that hold excess allowances because they have controlled their mercury emissions below their allotted allowances. The total U.S. cap cannot be exceeded, regardless of the plans states choose. Therefore, if one state exceeds its budget under cap and trade, another state(s) must emit an equal amount less than its budget. The exception to this is that EPA’s cap and trade program allows banking of mercury allowances, which could allow exceedances of the national cap in a specific year if emissions were banked in a previous year(s) by the same amount.

There are numerous options for meeting the requirements of CAMR in Montana. Four proposed options that capture the range of possible outcomes are discussed in detail below. This analysis compares the benefits and costs of these four options. EPA’s cap and trade option will be used as the baseline option, because that is the rule that Montana would be subject to if it did not adopt its own plan. The other three options involve establishment of hard emission limitations for each individual mercury-emitting generating unit that cannot be exceeded. The greatest differences in costs and benefits of meeting CAMR will occur between the EPA cap and trade option and the other three options with hard emissions limitations. As will be discussed, these three options would require, in 2018, the reduction of 600-650 lbs of EGU-produced mercury annually from current levels. Under cap and trade, that reduction could be less (e.g. emissions could be more) if Montana EGUs bought allowances to emit mercury beyond the Montana’s initial Hg allowance budget. The reduction in mercury emissions could be more than 600-650 lbs. under any of the four options if Montana EGUs collectively control mercury beyond the reduction reflected in the initial budget dictated by CAMR.

This analysis is primarily concerned with cost and benefit differences <u>between</u> the four options, as opposed to the costs and benefits <u>of</u> the four options. The cost comparison in the analysis will discuss differences in the costs of reducing mercury between the four options. The benefits side will compare mercury reductions among the various options, and differences in the resulting benefits between the options. Benefits discussed in this analysis will mostly occur in Montana, although some benefits will be felt outside of the state because some mercury deposition from Montana EGUs likely occurs in other states. Because most of Montana’s electrical generating capacity is owned by out-of-state interests and provides electricity to other states, most costs, primarily any costs included in the electricity rate base, could be borne by utility customers, corporations and stockholders in other states. Montana ratepayers are not expected to see any significant rate increases in their electric bill from CAMR, nor are out-of-state customers. Most CAMR benefits are not quantified in monetary terms due to a lack of available data and research, but magnitudes of all effects are estimated where feasible.

1.2 Montana EGUs

Mercury emissions from Montana EGUs and other sources currently have an adverse environmental impact on Montana. Montana currently has statewide fish advisories for northern pike, lake trout, and walleye greater than 15 inches, due to mercury contamination, recommending no consumption by sensitive populations, which includes children and pregnant women. The statewide advisory also recommends limited consumption by sensitive populations of bass, burbot, grayling, perch, salmon, sunfish, brook trout, brown trout, cutthroat trout, rainbow trout, walleye less than 15 inches, and whitefish, with the suggested consumption limit varying by fish species, from one meal per week to four meals per week. There also are numerous other advisories around the state warning against eating other types of fish from different water bodies, due to high levels of mercury (DEQ, 2006). It is unclear whether the mercury in Montana's waterbodies is mostly from local sources or if it is from a combination of local, national, and global sources.

The DEQ estimates that Montana's EGUs currently emit an average of 900-950 lbs of mercury per year[1]. Montana's annual EGU mercury budget under CAMR is 754 lbs. per year starting in 2010 and 298 lbs per year starting in 2018. This is a mercury emissions decline of about 21% and 68%, respectively, from current levels (assuming the 950 lb. current emissions number), not including future EGUs that are yet to be built.

Montana's existing EGUs include Colstrip Units 1-4, owned by a consortium of utilities and operated by PPL-Montana (the largest owner), and the Rosebud Power Plant, owned by Colstrip Energy Limited Partnerships (CELP). Both of these are located in the town of Colstrip east of Billings. Montana's EGUs also include the Corette plant, which is owned by PPL-Montana and located in Billings; the Lewis and Clark Station, which is owned by Montana-Dakota Utilities (MDU) and located in Sidney; and Rocky Mountain Power (RMP), located in Hardin which just recently came on-line. Colstrip Units 1-4 currently account for about 90% of the EGU total electrical output and mercury emissions in the state of Montana. Thus, most of the economic analysis in this evaluation will refer to the effects on and from Colstrip Units 1-4 from CAMR. However, the other EGUs would also be affected by CAMR.

EGU plants that are currently being built or that have received a draft or final air quality permit include the Southern Montana Electric (SME) Highwood Generating Station, proposed to be located near Great Falls (draft permit), and Bull Mountain Development Company No. 1, LLC's Roundup Power Project, proposed to be located south of

[1] This assumes a 90% capacity factor for all EGUs. DEQ's current estimate of annual mercury emissions for existing facilities is 1042 lb/yr at 100% capacity, and 938 lb/yr at 90% capacity. In 2001, the total reported mercury emissions from EGUs in Montana was 982 pounds, which represents 92% of all human-caused mercury air emissions in the state, according to EPA's Toxic Release Inventory

Roundup (final permit). Other EGUs that have been proposed, but which have not yet submitted an application for an air quality permit, include a lignite coal plant planned by Great Northern Power Development near Circle, MT and possible coal gasification plants in the eastern part of the state.

For reference, Montana produced 0.9% of coal-fired net electrical generation in the U.S. in 2005 and 0.88% in 2004 (U.S. Energy Information Administration (U.S. EIA)).

II. Four Different Options for Meeting CAMR

Four options for meeting the requirements of CAMR are outlined here and then discussed in detail. While there are many possible mercury control plans that would meet the requirements of CAMR, these four options capture the range of proposals that have been suggested to the Board of Environmental Review (BER) during the rulemaking process. The DEQ proposed rule, Noticed rule and "No Trading" options are much closer to one another in economic impact than they are to the EPA cap and trade program.

- EPA default cap and trade program
    - Trading allowed--unrestricted participation in national cap and trade program
        - States are allotted a mercury budget that can be allocated to EGUs subject to CAMR or other legal entities (e.g. conservation groups)
        - The Montana mercury budget has two tiers, 754 lbs in 2010 and 298 lbs in 2018
        - States cannot allocate mercury allowances in excess of their state budget
        - Mercury allowances are allocated primarily to existing EGUs, 95% in 2010, and 97% in 2018
        - Compliance is demonstrated by EGUs holding one allowance for each ounce of mercury emitted per year
        - EGUs' actual mercury emissions can exceed their initial mercury allowance allocation if they buy additional allowances, but overall U.S. cap must be met (excluding banked allowances). Thus, for some U.S. EGUs to exceed their allowance allocation, others must reduce emissions to below theirs
        - In the future, owners or operators of new EGUs in Montana could buy, on the national market, the allowances they need to operate

- DEQ proposed alternative
    - Trading allowed, but Montana EGUs must meet a hard emissions limit
        - Establishes input-based emission limit of 0.9 lbs/TBtu for non-lignite burning EGUs
        - Higher limit of 2.16 lbs/TBtu for lignite-burning EGUs
        - Allows alternative emissions limit (AEL) if an EGU cannot meet the 0.9 or 2.16 lbs/TBtu emission limit

    - Incorporates EPA cap and trade by reference except for allowance allocation scheme
    - Approximately 70% of mercury allowances allocated to existing EGUs (units that commenced operation before January 1, 2001), the remainder allocated to EGUs currently holding draft or final air quality permits
    - From 2010-2014, allocates mercury allowances to existing non-lignite burning sources at 2.4 pounds per trillion British thermal unit (lb/TBtu), existing lignite-burning sources at 5.76 lb/TBtu, new non-lignite burning sources at 1.5 lb/TBtu, and new lignite-burning sources at 3.6 lb/TBtu
    - Starting in 2015, allocates mercury allowances to existing EGUs in an amount equal to their emission limit
    - EGUs cannot, under any circumstances, exceed their emissions limit or alternate emissions limit (AEL), if applicable.[2] As the AEL is phased out in 2018, owners or operators of existing EGUs will probably only sell allowances; they would only buy them for speculation, not compliance purposes
    - In the future, owners or operators of new EGUs in Montana could buy the mercury allowances they need to operate on the open market, so state budget of 298 lbs. of mercury could be exceeded in that way
    - National emissions cap must be met (excluding banked allowances)
    - AEL must be renewed prior to expiration in 2015 to maintain an AEL (must meet a stricter test to obtain renewed AEL)
    - AELs expire 2018 (emission limits become firm at that time)

- Noticed Rule--Rule Noticed for Comment by Board of Environmental Review (BER)
  - Same as DEQ’s alternative (emissions limits with AEL), except for
    - No trading allowed after 2014
    - No higher emissions rate allowed for lignite-burning EGUs
    - AEL may be allowed indefinitely, with periodic (4 year) review, if a facility is unable to meet its emission limit, as long as establishment of the AEL would not cause an exceedance of the state budget starting in 2015
    - After 2015, a new EGU could operate in Montana only if it could obtain a mercury emission offset from an existing Montana EGU, to stay under the state mercury emissions cap. Before 2015, it could buy needed allowances on the cap and trade market.

[2] The alternate emission limit (AEL) provision would establish a temporary emission limit if a facility is unable to comply with the 0.9 (non-lignite) or 2.16 (lignite) lbs/TBtu emission limit and the facility installs and operates control technology or boiler technology, or employs practices, projected to meet the mercury emission limit.

- “No Trading” Alternative
    - Trading prohibited
        - Emission limits w/ AEL
        - Total allowable mercury emissions from EGUs cannot at any time exceed state-wide mercury emission cap of 754 lbs per year from 2010-2017 and 298 lbs per year starting in 2018
        - Higher emissions limit for <u>existing</u> lignite plants, not new lignite plants
        - A new EGU could locate in Montana only if it could obtain a mercury emission offset from an existing Montana EGU

2.1 EPA’s Interstate Cap and Trade Option

In 2010, under the EPA cap and trade option, the default allocation scheme would allocate 95% of allowances to existing EGUs. In 2018, the default allocation scheme would allocate 97% of available mercury allowances among existing EGUs according to their generating capacity. Those allowances are transferable among all regulated facilities in the U.S., so that EGUs in some states may emit more mercury than their state’s mercury budget as long as some EGUs in other states emit at least an equal amount less than their allowance allocation. They would also have to be willing to sell these allowances at the market price.

In a cap and trade (or “tradable emissions”) system, EGUs can choose if they want to control emissions, how to control emissions and how much to control emissions. Should they choose to control emissions, EGUs may select the method of pollution control, be it through installing control equipment, producing less energy, or switching to cleaner fuels. Due to the nature of mercury, most EGUs will use one of the three or four available control equipment technologies available today including Activated Carbon Injection (ACI) and chemical addition. Owners or operators of EGUs can use, buy, sell, or bank allowances, depending upon their needs for a given time period. They can use their total emissions allowances, or sell unused portions to other EGUs if they hold more allowances than they need (e.g. they control mercury to a level below their allowance allocation). They can buy additional allowances at the market price, should that be cheaper than controlling their mercury emissions. They may also save or bank allowances for later use in certain circumstances. These options would be limited or not be allowed under the DEQ, Noticed rule and “No Trading” options.

Under cap and trade, the owner or operator of an EGU may choose to not install additional mercury control equipment or employ additional mercury control practices past a certain level if the relative costs of emissions control make it less expensive at a certain level of control to buy allowances. Or, they may choose to install additional mercury control equipment or employ additional mercury control practices if they can do so at less cost than the price of allowances, which they can then sell for a profit. On newer units, the cost of pollution control often is less than the allowance price. In theory, allowance trading would continue until the cost of controlling another ounce of mercury pollution is the same for all EGUs in the cap and trade system, and is equal to the cost of an allowance. Under EPA's cap and trade option, if mercury emissions from new EGUs entering the market exceeded a state's available allowances, their owners or operators could buy the allowances they would need at the going allowance market price. Allowances could also be banked, so that different amounts of mercury pollution could occur in different years for a given EGU. In other words, EGUs would have flexibility in meeting CAMR under cap and trade—more flexibility than under the other three options.

For example, if a Texas EGU wanted to emit 100 lbs. more mercury than its initial allocation in 2011 by buying mercury allowances, then a combination of EGUs elsewhere in the U.S. would have to emit at least 100 lbs. less than their initial allocations to allow such a transaction to take place, or the Texas EGU would have had to bank 100 lbs. of allowances from previous years. EGUs in states that do not participate in EPA's cap and trade option will not be able to trade in such a system and will have to comply, by state, with the individual EPA-mandated state budgets.

EPA's cap and trade method of controlling mercury under CAMR involves unrestricted trading and no emissions limits in a given state, at a given facility, or on a given emitting unit, although the U.S. as a whole must meet its cap. The only exception to this requirement is the banking of allowances, as mentioned above. The EPA cap and trade program allows EGUs to bank allowances. Mercury emissions in a given year may exceed the national "cap" if most EGUs, on average, emit mercury at a rate near their allowance allocation and a substantial number of EGUs also use banked allowances. Averaged over time, however, the national cap will be met on an annual basis. Under this option, Montana's existing EGUs (Colstrip Units 1-4, Corette, Lewis & Clark Station and Rosebud Power Plant) would get an allocation of mercury emissions allowances equal to about 289 lbs. total per year (in 2018), with allowances equal to about 9 lbs. left over for new sources. The Hardin Generating Station, Highwood Generating Station, and Roundup Power Project EGUs are estimated to require mercury allowances approximately equal to 17, 36, and 98 lbs., respectively, to operate at capacity (the Highwood Generating Station and Roundup Power Project are not yet in operation), so they would have to buy allowances on the market or find ways to control mercury even more than what is currently planned. Hardin is now operating and would have to buy those 17 lbs. per year from other EGUs in cap and trade.

Under this option, Montana EGUs would be able to comply with CAMR in one of several ways. They could control mercury emissions by buying allowances to cover any shortfall between there actual emissions and their allowances, control exactly the amount dictated by their allowances, or sell allowances if they control their mercury emissions to a level lower than their allocation. As long as the EGU had sufficient allowances to cover its actual Hg emissions, then it would be in compliance. Thus, the cap and trade rule contains no hard limits.

2.2 DEQ's Proposed Rule with Emission Limits and Trading

DEQ's proposed rule would allow trading, but would also impose a hard emission limit. DEQ's rule would limit EGU mercury emissions in-state to 0.9 lb/TBtu for non-lignite EGUs and 2.16 lbs/TBtu for lignite EGUs, on a rolling 12-month average, beginning January 1, 2010, or when commercial operation begins, whichever is later. The DEQ proposal would require existing EGUs to submit an air quality permit application to the Department by July 2009 to establish these limits and would require operation of pollution control equipment or practices that are projected to meet their applicable limit by January 1, 2010. Based on those emissions rates, the mercury emissions from existing and currently proposed EGUs for the state as a whole would be slightly under the 298 lb. per year mercury budget. EGUs could participate freely in the cap and trade program as long as they met their emission limit. The DEQ proposal incorporates the federal cap and trade program.

From 2010-2014, the proposed allocations would be higher than the DEQ mandated emission limitations (2.4 lb/TBtu for existing, non-lignite burning EGUs; 5.76 lb/TBtu for existing, lignite-burning EGUs; 1.5 lb/TBtu for new, non-lignite burning EGUs; and 3.6 lb/TBtu for new, lignite-burning EGUs) to allow the facilities some flexibility with respect to optimizing control technology and their potentially applicable alternative emission limit and to allow facilities to sell extra allowances to recoup costs for mercury control. Starting in 2015, the proposed allocations would equal the mercury emission limitations of 0.9 lb/TBtu for non-lignite burning EGUs and 2.16 lb/TBtu for lignite-burning EGUs. Starting in 2018, any alternative emission limits that had previously been granted would expire.

By requiring EGUs to meet the emission limit, their owners or operators would not need to buy allowances because their mercury emissions could not exceed their allocation, so that trading would actually be quite limited. In reality, starting in 2018, owners or operators of EGUs in Montana would only sell allowances, since their emissions could not exceed their initial allocation under any circumstances including buying allowances. So, the trading would be limited to selling allowances to out-of-state EGUs and future new Montana EGUs.[3]

[3] In 2018, when all EGUs must meet the 0.9 lb/TBtu standard, there would be no selling of allowances to another existing Montana EGU. If an EGU controlled mercury below 0.9, it could sell to a new Montana source or to someone out of state. Prior to 2018, one EGU could sell to another existing Montana EGU provided that EGU had an alternative emission limit above 0.9 (they could not use allowances they have purchased to go above the emission limitation). MT EGUs would need to purchase allowances under only two situations. From 2010 to 2014, an EGU with an Alternate Emission Limit (AEL) that significantly exceeds its allowance allocation would have to purchase allowances to cover the difference between actual emissions and the allowance allocation. During this period most EGUs would have allowance allocations in excess of their emission limits and AELs. From 2015 to 2017, an EGU with an AEL would exceed its allowance allocation because allowances would be allocated based on the 0.9/2.16 limits, not on AELs. In this time period any EGU with an AEL would have to purchase allowances to cover the difference. Beginning in 2018, only new EGUs would need to purchase allowances, because all existing and proposed EGUs would have allowance allocations equal to their allowable emission limits. Existing EGUs could purchase allowances for purposes of speculation.

The DEQ proposed alternative would allow EGUs to obtain an Alternative Emissions Limit (AEL) if they can demonstrate that they cannot meet the 0.9 or 2.16 lbs/TBtu emission limits and are operating the equipment to control mercury emissions as defined in the proposed rule. If an EGU has an alternative emission limit, it would have to comply with that limit and buy allowances above its allocation. Thus, the binding limits are the 0.9 and 2.16 lb/TBtu limits or the applicable alternative limit on a 12-month rolling average. As previously mentioned, the AEL expires at the end of 2017. New EGUs in the future could buy allowances to enter the market, and thus potentially push Montana’s annual mercury emissions over 298 lbs. under DEQ’s proposed option.

Because EGUs don’t always run at full capacity and have down time, owners or operators of EGUs always meeting the 0.9 lb/TBtu standard would have a few extra allowances to sell during the year from their initial allowance allocation. The amount they could sell would likely be between 5-20% of their total. These allowances could be sold on the open market. These allowances sold would be a source of revenue for the EGUs to partially offset some costs of mercury control. This trading would be allowed to go on indefinitely, but all EGUs would have to meet their emission limit. Under EPA’s cap and trade rule, EGUs would not have emission limits with which they would have to comply.

Montana’s proposed rule is more of a command-and-control rule than EPA’s interstate trading rule. The EPA interstate trading rule would allow Montana’s EGUs to emit greater amounts of mercury than their initial annual allowance allocation, if in-state EGUs, in effect, paid out-of-state EGUs (by buying allowances) to pollute less than their initial mercury allowance allocation. Under Montana’s proposed rule, EGUs would have to stay within their mercury emission limits. Because there are different technological options available for reducing mercury, the DEQ proposed rule does not tell EGUs how to reduce mercury, but simply what their emission limits will be.

2.3 “Noticed Rule”--BER Noticed Rule with Emissions Limits and No Trading after 2014

The Noticed rule is similar to DEQ’s rule with three major differences. First, no trading would be allowed after 2014. From 2010-2014, Montana EGUs would be able to participate in the national trading program, including the banking of allowances. After 2014, the 298 lb. budget would have to be met without trading or using banked allowances. Thus, after 2014, EGUs in Montana would have to meet the emission limits, as with the DEQ’s proposed rule. The second difference is that, after 2014, new EGUs would be allowed to enter Montana’s market only if they pay for mercury emission offsets at existing Montana EGUs, in order to meet the 298 lb. state cap. Before 2015, new EGUs could buy allowances to enter the market as in the DEQ proposed and EPA cap and trade rules. A third difference is that in the noticed rule there is no mandatory final expiration date for AELs. However, the DEQ could not establish an AEL that would cause an exceedance of Montana’s mercury budget, starting in 2015.

2.4 “No Trading” Rule with Emission Limits and No Emission Trading

The ”No Trading” rule is similar to the noticed rule except that no trading would be allowed at all at any time. The big difference this makes is that owners or operators of EGUs could not buy or sell any allowances ever—they would simply have to meet their emission limits. Starting in 2010, new EGUs would be allowed to enter Montana's market only if they could obtain mercury emission offsets from existing Montana EGUs to meet the 298 lb. state-wide cap. Under this rule, the 298 lb. cap could never be exceeded. Because the noticed rule would eliminate all trading after 2015, the noticed rule and the "No Trading" rule would have the same requirements starting in 2015.

2.5 Annual Emissions under the Four Options

Starting in 2015, annual emissions under the No Trade rule and the Noticed rule would be 298 lbs. at most (unless new EGUs entered Montana before 2015 under the Noticed Rule by buying allowances). Emissions under DEQ's proposed rule would be no more than 298 lbs. annually unless new EGUs bought out-of-state allowances under the DEQ and BER rules.

Under EPA's cap and trade rule, the amount of mercury emissions is less clear. It is hard to know how much mercury would be controlled in Montana, and how many allowances would be purchased under cap and trade versus the hard cap of 298 lbs. in the other three options. Under cap and trade, EGUs could buy as many allowances as they are willing to pay for, without reducing mercury emissions. Colstrip is really the main focus here as the EGU that would buy the majority of allowances purchased by EGUs in Montana, and it is unknown what it would do.

For example, in a study conducted by National Economic Research Associates (NERA), commissioned by PPL-Montana, it is estimated that Colstrip would reduce mercury emissions 77% under cap and trade, versus the 83% reduction it would need under the hard limits of the other three options. Thus, according to NERA, total emissions in Montana starting in 2018 would be similar under cap and trade to what they would be under the other three rules—about 350 lbs. per year under cap and trade, versus about 300 lbs. under the other three options. On the other hand, a study commissioned by the National Wildlife Federation, using the Integrated Planning Model (IPM) developed by EPA, puts the estimate of Colstrip mercury reduction under cap and trade at only 36% (NWF, 2006) and puts Montana's total reduction at 30%, which would lead to just over 600 lbs. per year of emissions in Montana versus 298 lbs. under the other three rules. Under one scenario, emissions would be similar under all four options, while, under the other scenario, Montana EGU emissions would be 100% greater under cap and trade (again, starting in 2018). Because these are the only data available, and because Colstrip constitutes 90% of Montana EGU emissions, this analysis uses 36% reduction as the lower bound for Colstrip's estimated mercury reduction under cap and trade and 77% as the upper bound. Including the other EGUs, this translates into about 350-600 lbs. per year of annual mercury emissions under cap and trade versus 298 lbs. (or slightly more) under the other three options.

Under all four of the options, EGUs would have to comply with the monitoring, recordkeeping, and reporting provisions of CAMR (40 CFR Part 75) with regard to mercury mass emissions. Compliance with either applicable limits and/or allowances held would be measured with one of the continuous mercury measurement systems or with an appropriate long-term method (e.g., sorbent trap) as required under the federal rule. Furthermore, new plants would have to meet new source performance standards regardless of how states choose to proceed.

III. Benefits of the Four Options for Meeting CAMR

Before estimating the benefits of each of the four options, this analysis provides a short discussion of the general benefits of reducing mercury under CAMR.

3.1 General Benefits of Reducing Mercury under CAMR

The following text relates to the adverse effect of mercury on humans and the environment, and thus also relates to the social and economic benefits of lowering mercury emissions. The text included in the following paragraphs is taken directly from DEQ's mercury emissions rule which also uses information from EPA's mercury web site at http://www.epa.gov/mercury (DEQ, 2006).

According to the EPA, coal and oil-fired electric utility steam generating units are the largest domestic human-caused source of mercury emissions. The EPA states that mercury in the environment presents significant hazards to public health and the environment. Mercury in the air eventually settles into water or onto land where it can be washed into water. Once deposited, microorganisms can convert mercury into methyl mercury, a highly toxic form that accumulates in fish, shellfish, and birds and other animals that consume fish, with concentrations increasing further up the food chain. At high levels of exposure, the effects of methyl mercury on birds and mammals may include reduced reproduction, slower growth and development, abnormal behavior, and death. Thus, reducing mercury has ecological benefits for mammals and birds.

Mercury may have adverse effects on humans who eat a lot of fish. Across the U.S., mercury imposes most of its measurable economic costs through the human consumption of freshwater fish, which can result in health problems. The typical U.S. consumer eating a wide variety of fish from restaurants and grocery stores is not in danger of consuming harmful levels of methyl mercury from fish and is not advised to limit fish consumption. Those who regularly and frequently consume large amounts of fish, either marine or freshwater, are more exposed. Because the developing human fetus may be the most sensitive to the effects from methyl mercury, women of child-bearing age are regarded as the population of greatest interest.

Fish and shellfish are the main sources of methyl mercury exposure to humans, with large fish that eat other fish generally having the highest concentrations. Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. High levels of methyl mercury in the bloodstream of unborn babies and young children may harm the developing nervous system, impairing the ability of a child to think and learn.

EPA has established a blood mercury level reference dose (RfD) of 0.1 micrograms/kilogram of body weight per day as an exposure level without recognized adverse effects. In a 1999-2000 National Health and Nutrition Examination Survey of 16 to 49-year old women, approximately 8% of the women in the survey had blood mercury concentrations reflecting greater than EPA's RfD. Based on this survey, EPA estimates that more than 300,000 babies born each year in this country may have increased risk of learning disabilities associated with in utero exposure to methylmercury.

3.1.1 Human Health Benefits

In Chapter 2 of the U.S. EPA's *Regulatory Impact Analysis of the Clean Air, Mercury Rule--Final Report* (from here on, referred to as the 'RIA'), several conclusions were made with respect to mercury's adverse effects (U.S. EPA, 2005b). It is the lowering of these effects that will constitute the main benefits of the mercury rule in Montana. EPA's RIA lists the main adverse effects of mercury known today:

• Children who are exposed to low concentrations of methylmercury prenatally may be at risk of poor performance on neurobehavioral tests, such as those measuring attention, fine motor function, language skills, visual-spatial abilities and verbal memory.
• Some recent epidemiological studies in men suggest that methylmercury is associated with a higher risk of acute myocardial infarction, coronary heart disease and cardiovascular disease in some populations. Other recent studies have not observed this association. The studies that have observed an association suggest that the exposure to methylmercury may attenuate the beneficial effects of fish consumption.
• The exposure levels at which neurological effects have been observed may occur via consumption of fish (rather than high-dose poisoning episodes). Exposure levels of concern for these effects generally are within two orders of magnitude of typical exposures for women of child-bearing age, and within approximately an order of magnitude of the high end of the U.S. exposure distribution.
• There is some recent evidence that exposures to methylmercury may result in genotoxic or immunotoxic effects. Other research with less corroboration suggests that reproductive, renal, and hematological impacts may be of concern. There is insufficient human data to evaluate whether these effects are consistent with levels in the U.S. population.
• Plant and aquatic life, as well as fish, birds, and mammalian wildlife can be affected by mercury exposure. However, overarching conclusions about ecosystem health and population effects are difficult to make at this time.

These benefits from CAMR that EPA was unable to quantify are summarized below from Table 10-45 of the RIA. Such benefits could also occur as a result of Montana's proposed rule. This table displays the health and ecosystem effects associated with methyl mercury exposure which the EPA is currently unable to quantify. That table is reproduced below.

Table 10-45. Unquantified Health and Ecosystem Effects Associated with Exposure to Mercury

Category of Health or Ecosystem Effect	Potential Health or Ecosystem Outcomes
Neurologic Effects	Impaired cognitive development Problems with language Abnormal social development
Cardiovascular Effects*	Potential for fatal and non-fatal myocardial infarctions (heart attacks)
Genotoxic Effects*	Associations with genetic effects
Immunotoxic Effects*	Possible autoimmunity effects in antibodies
Ecological Effects*	Neurological effects in wildlife (birds, fish, and mammals) that are similar to effects in humans

* These are potential effects and are not quantified because the literature is either contradictory or incomplete.

3.1.2 Ecological Benefits

EPA's RIA states that a quantitative analysis of the ecological benefits of reduced mercury emissions is not possible at this time given the current state of the science. Recent research on the ecological effects of mercury exposures does provide qualitative support to the notion that reductions in mercury emissions from various sources should lead to improvements in overall ecosystem health. The bulk of this research, based on both laboratory and field studies, suggests that because mercury is persistent in the environment and biomagnifies up the food chain when methylated, a wide variety of species and ecosystems may be harmed by excessive levels of mercury in the environment (U.S. EPA, 2005b, p. B-6).

Adverse effects to avian species and wildlife have been observed in laboratory studies at levels corresponding to fish tissue methylmercury concentrations that are exceeded by a significant percentage of fish sampled in lake surveys. Generally, wildlife consume fish from a much more limited geographic area than do humans which can result in elevated levels of mercury in certain fish-eating species in localized geographic areas. Those species can include kingfisher, river otter, raccoon, and loon, as well as some endangered species (EPA mercury website). Ecological benefits valuation is simply not advanced enough to estimate any values for this analysis. Although the magnitude of the power plant contribution to ecological exposures cannot be quantified so the corresponding risk for adverse effect cannot be determined, reducing the presence of mercury in the environment should reduce the potential for adverse ecological impacts, according to the EPA, on various species in the environment.

Mercury levels in all of these ecosystems are likely declining as a result of recent regulations, but the quantitative effect on the ecosystems is unclear because the decline is slow, depending on sediment burial as a primary mechanism (U.S. EPA, 2005b, p. B-12).

3.2 Benefits to Montana of CAMR

This section discusses the benefits from all four options, and then compares the benefits from all four options. Monetary and non-monetary/non-quantified benefits are examined in this section. Non-monetary benefits as used in this analysis still involve real value, and in some cases monetary values, but cannot be measured monetarily at this time. They are not less important than monetary benefits, but simply less measurable. It is possible that the monetary benefit number and non-monetary benefit magnitude estimates from mercury reduction would increase substantially in this analysis if more research were available. Only the value of increases in IQ levels from decreased mercury exposure and some cardiovascular benefits in men can be estimated monetarily. Other health effects and ecological benefits cannot be estimated monetarily due to lack of available research. Other uncertainties in this benefits section include where mercury is deposited from Montana EGUs, and the geographic source of mercury currently deposited in Montana.

The benefits of the mercury rule would be felt by those who live downwind and near Montana's EGUs—primarily in Central and Eastern Montana, and partially in Wyoming and in the Dakotas. Health costs could go down for affected populations, which is a benefit, but evidence suggests that only a few people would be beneficially affected financially from mercury reductions at Montana EGUs (in part, due to lower population densities the affected area). Overall health would likely improve in the area for a few people, including those not directly affected financially by health care.

The No Trading and Noticed rule options would have the greatest benefits, followed by DEQ's proposed option and then EPA's cap and trade option. Monetary differences between the four options (i.e. differences in human IQ) would be insignificant. The monetary range of benefits for Montana from CAMR is estimated to be between $135,000 and $286,000 annually from higher IQ levels, and this is considered insignificant on a statewide level. The difference in benefits between the EPA cap and trade rule and the No Trading rule would be expected to be about $28,000 to $218,000 per year or 50-90% of the total benefits range (discussed further below). Over 40 years (2010-2050), in today's dollars and using a 5% discount rate, the total monetary benefits to Montana from CAMR would be $2.4 to $5.0 million. The difference in monetary benefits between EPA cap and trade and No Trading would be $0.5 to $3.8 million over 40 years. These numbers do not include non-monetary benefits. It is important to note that these are very rough monetary benefit estimates using the 'benefits transfer' method. Under the benefits transfer method, one can apply numbers from existing studies to a different area that has not been studied, such as Montana. This method is used frequently where localized primary research is nonexistent. The timeframe of this impact analysis and DEQ resources do not allow DEQ to do original research on how significant these benefits would be.

Non-quantified and non-monetary benefits in Montana from CAMR-related improvements in human and ecological health could be significant. Thus, the non-monetary differences in those benefits between the EPA cap and trade and the other three options could also be significant.

3.2.1 General Summary Discussion of Montana Benefits from the Four Options

The three options to meet CAMR that have hard emissions limits (DEQ's, the Noticed rule, and No Trading) are expected to produce similar mercury reductions because they all involve a hard emissions cap that cannot be exceeded in the long run (except for new sources locating in Montana in the DEQ and Noticed option). Therefore, the differences in benefits between these three options are expected to be minimal, since they should all result in similar mercury reductions. The difference in benefits between EPA's cap and trade and the other three options is expected to be more significant.

For reasons discussed above in Section 2.5, the difference in total annual Montana EGU mercury emissions between EPA's cap and trade program and the other three options is expected to be between 50 lbs. and 300 lbs. per year after 2018. Another way of saying this is that there is expected to be 350-600 lbs. total annual mercury emissions under cap and trade after 2018 versus 298 lbs. (or a bit more) under the other options. Cap and trade is expected to result in greater levels of mercury emissions than the other three options. At the high end estimate of 600 lbs. per year, Montana EGU emissions under EPA's cap and trade rule (after 2018) would be twice the emissions under the other three options. At the low end of 350 lbs., the mercury emissions are much closer to the 298 lbs. per year under the other options. Another way to state this is that mercury reduction from Montana EGUs would be about 10-50% less under cap and trade versus the other three options. Most of the emissions difference that would occur would come from Colstrip's emissions.

Based on very limited quantifiable health benefit data available, the currently quantifiable human health benefits from all four options are expected to be insignificant in monetary terms in Montana, and thus so are the monetary differences in benefits between all four rules (even considering a possible 100% difference in emissions levels between options). In non-monetary terms, the exact extent of human health and ecological benefits are unknown but could be significant, as could be the differences between the EPA option and other three options. Improved human and ecological health would constitute those potentially significant non-monetary benefits. Other non-quantified benefits to Montana from mercury reduction could include lower lost work days, better visibility, decreased asthma attacks, decreased damage to ornamental, agricultural and wild plants, decreased damage to recreational fishing, and increased existence values for wilderness. Some of these benefits would occur from the decrease in other pollutants reduced by mercury control, and these could be significant in Montana. The more stringent CAMR options would provide greater benefits to humans (both neurologically and for cardiovascular health), fish, birds and mammals.

Some emissions control strategies adopted by power plants to meet cap-and-trade regulations implemented under CAMR may result in co-benefits including reductions in direct emissions of particulate matter (PM). These PM emissions reductions could result in decreased population-level exposure to particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), which, in turn would produce reductions in adverse health effects, including both morbidity and premature mortality for the U.S. population. EPA was not able to conduct a comprehensive assessment of health benefits associated with reductions in directly-emitted $PM_{2.5}$ from coal-fired power plants. Thus, DEQ has no studies from which to estimate any secondary $PM_{2.5}$ benefits from CAMR.

In order to meet the hard emissions limits under the three more stringent CAMR options, fabric filter baghouse technology might have to be adopted by Colstrip by means of a retrofit. If fabric filter technology is used by Colstrip, there would be additional environmental side benefits to Montana with respect to increased particulate control from the Colstrip facility. If, during the retrofit, the current wet venturi scrubbers had to be modified to incorporate a spray dryer absorber technology (a different type of SO_2 control), there would be additional benefits to Montana including further SO_x reduction from current levels, fewer slurry pond problems, and less water usage from the Yellowstone River. In addition, a fabric filter with a spray dryer absorber at Colstrip would use less 'parasitic' energy from its generators than the current wet scrubber. The spray dryer absorber could use up to 20 average Megawatts (aMW) less at Colstrip than the current wet-scrub technology, which would result in approximately $5.3 million annually in savings to PPL from less electricity usage ($30 per MWhour X 20aMW X 8760 hours in a year). To put this in perspective, the initial capital cost of such technology could be $250-$500 million (as discussed below) which would be weighed against the $5.3 million saved annually in increased electrical production (reduced usage).

3.2.2 Estimates of Montana Monetary Benefits from CAMR

One can make a very rough upper bound guess for monetary benefits of Montana's mercury reduction under the most stringent rule, the No Trading rule. Because it is the most stringent of the options, the No Trading rule would result in the greatest monetary benefits from the most reduced mercury. The EPA cap and trade option is the least stringent and would almost certainly have the least benefits because mercury would almost certainly be reduced the least under that option. In Chapter 10 of the EPA RIA, the monetary benefits of lowering mercury emissions via CAMR are estimated. (See Appendix B of this analysis for more details.) EPA has monetary estimates for human health benefits from mercury reduction for the eastern 37 U.S. states. The estimates cannot be applied directly to the U.S. West, however, they can be used as a benchmark. The human health benefits from lowering mercury are expected to be very small in the U.S. West according to EPA.

As stated above, the DEQ has no studies of its own on the benefits to Montana from mercury reduction, so this analysis uses the "benefits transfer" method of estimation. The monetary benefits of lowering mercury emissions are estimated by the EPA for only one major type of mercury impact—the benefits of higher IQs in children from lower emissions. The higher IQ benefits are measured for the 37 eastern states in the U.S., which does not include Montana. The total benefits from CAMR (over existing Clean Air Interstate Rule (CAIR) control benefits that will be in place at that time) of higher IQ levels in children are less than $5 million for all 37 states (p 10-10). It is assumed that this $5 million benefit is an annual number. This number does not take into account all potential monetary IQ benefits of mercury reduction for various reasons. If one takes the $5 million per year for 37 states, and divides that by 37, then the average state sees a total benefit of about $135,000 annually.[4]

Considering that effects in the West are predicted to be lower than in the eastern states and that Montana is sparsely populated, the $135,000 number serves as an estimated high-end annual monetary benefit estimate for Montana for increased IQ from the most stringent No Trading rule. That rule is used for this figure because it guarantees Montana staying under its budget. Some of this $135,000 in annual benefits would certainly be felt by people that live in states to the south and east of Montana such as North Dakota, South Dakota and Wyoming. Differences in monetary benefits between the four approaches would be smaller than that total benefit number. The Noticed rule and DEQ rule should create monetary benefits close to the $135,000 number. The cap and trade option may not be close to that amount. Ninety percent and fifty percent of the $135,000 number, which is the percentage range of mercury reduction from EPA's cap and trade option compared to the No Trading rule, is about $68,000 to $122,000 in annual CAMR benefit from cap and trade. That is a monetary benefit difference (as a monetary upper bound) between EPA and the No Trading scenarios of $13,000 to $68,000 annually using the RIA study. The estimated $135,000 annual benefit to Montana from CAMR is only one of two studies and is the lower benefit estimate.

"The Harvard Study" published by the Northeast States for Coordinated Air Use Management (NESCAUM, 2005) found that strong mercury controls on EGUs, similar to the controls originally suggested by the EPA in CAMR (a 15 ton cap), could save the U.S. nearly $5 billion annually through reduced neurological and cardiac harm to humans. $1.3 billion of this estimated figure is due to neurological effects, $2.0 billion is due to mental retardation, and the rest is due to other effects including cardiovascular risk. One reason that these numbers are three magnitudes higher than EPA's RIA numbers is that this study includes a larger geographical area including the U.S. West and

[4] This $135,000 benefit number does not include any health benefits from less mercury going into the oceans exposing other segments of the population (coastal fishermen for example). The RIA discusses exposures to other segments of the U.S. population from mercury that should be taken into account. In Section 4 of the RIA, EPA discussed the other fish consumption pathways that lead to exposure to methylmercury, including consumption of commercial seafood and freshwater fish (produced domestically as well as imported from foreign sources), and consumption of recreationally caught seafood from estuaries, coastal waters, and the deep ocean. These consumption pathways impact additional recreational anglers who are not modeled in the benefit analysis as well as the general U.S. population. Reductions in domestic fish-tissue concentrations can also impact the health of foreign consumers (consuming U.S. exports). Due to technical/theoretical limitations in the science, EPA was unable to quantify the benefits associated with several of these fish consumption pathways. These effects are likely close to zero from Montana EGUs.

the coastal portions of the oceans around the U.S. Another reason is that the numbers include other quantified health effects besides IQ, including cardiovascular risk from mercury (which has not been conclusively proven to exist from existing research) and human mortality. Each human death prevented from mercury in these estimates represents millions of dollars in benefits. The RIA study did not deal with human mortality.

Because some of the effects of the estimated benefits from cardiovascular health in the Harvard Study have not yet been proven and admittedly in the study have a low chance of occurring, it is most accurate to count only the benefits in The Harvard Study that have a relatively high chance of happening and have been sufficiently proven. These benefits include preventing IQ deficits in all children from fetal methyl mercury (MeHg) exposures and lowering the cardiovascular effects and premature mortality in male consumers of non-fatty freshwater fish with high MeHg levels. The other low-probability cardiovascular benefits from the Harvard study are not considered here.

The number arrived at for the U.S. from the Harvard Study, including only those benefits mentioned above, is $86 million annually versus $5 billion annually, a number that includes low-probability cardiovascular effects. If this $86 million is used as a high end figure for the U.S., then taking Montana's population weighted portion of that amount leads to about a $286,000 benefit annually from mercury reduction, as a high end figure for Montana. This $286,000 may be overstated, because some Montana emissions likely will be transported into other states, and Montana's metropolitan areas are not generally downwind of the EGUs. It may also be understated if the low-probability events of lowering cardiovascular morbidity and mortality mentioned in the Harvard study actually occurred in Montana. Like with the RIA data, this $286,000 number is associated with the most stringent No Trading option. The Noticed rule and DEQ rule should be close to the $286,000 number. The cap and trade option may not be. Ninety percent and fifty percent of the $286,000 number, which is the range of mercury reduction from EPA cap and trade compared to the No Trading rule, is about $143,000 to $257,000 in annual CAMR benefit from EPA cap and trade. That is a monetary difference between EPA and the No Trading scenarios of $28,000 to $143,000.

<u>3.2.3 Differences in Benefits from CAMR Between the Four Options—Detailed Discussion</u>

As mentioned before, the benefits from CAMR would be the greatest for No Trading, then the Noticed rule, and then DEQ's proposed rule. They would be the lowest for EPA's cap and trade rule -- up to 50% lower. The benefits from reducing mercury would be greatest under the three rules with emissions limits, because mercury reductions would be guaranteed to meet the 298 lb. cap or a number not much higher than that. The No Trading option guarantees even fewer emissions than the Noticed and DEQ proposed options because it allows no trading, no higher limit for new lignite plants, and no buying of allowances for existing or new EGUs. Up to 2015, under DEQ's proposed rule and the Noticed rule, new EGUs could result in somewhat greater annual emissions. The EPA cap and trade option, with no specific emission limit for emitting units, facilities or states, would not be guaranteed to meet the 298 lb. limit in any year, and would have the least benefits from CAMR. Even by Colstrip's most favorable reduction estimates (about a 70% reduction), it would emit more under cap and trade than under hard emissions limits (NERA, 2006).

The differences in benefits between DEQ's proposed rule, the Noticed rule and the No Trading rule should be very minimal as discussed, since similar emissions are expected from each of these rules. The exception to that could be that under the DEQ proposed rule, future EGUs could buy allowances, pushing Montana over the 298 lb. limit in place for 2018. Significant differences in benefits, up to 50%, could occur between EPA's cap and trade option versus the other three options, depending upon the amount of emissions over the 298 lb. cap that would result from EPA's cap and trade option. Estimates are 350 to 600 lbs. per year under cap and trade, or 17% to 100% more mercury emissions under cap and trade than under the other three options (unless future EGUs buy out-of-state allowances) or about 10-50% less emissions reduction.

The monetary human benefits that can be measured from any of the four options discussed above are not quantified and may occur partially out-of-state. Differences in non-monetary human and ecological benefits between EPA's cap and trade and the other three options could be significant if a lot more mercury is emitted under cap and trade.

To the extent that the three options with emissions limits lower mercury more in Montana, the benefit of those three options would consist of currently unquantifiable increases in IQ to at-risk populations (those who eat more fish) and perhaps an increase in fishing recreation if state waters are perceived to be safer to fish. In Montana, such human populations might include fishermen and ethnic groups that eat a large amount of freshwater fish. It could include significant non-monetary benefits in neurological and cardiovascular health to those same populations. It could include less material and agricultural damage. For reasons discussed above, any differences in benefits between the four options would likely be smaller than in other parts of the country.

Two tribes in Montana, the Northern Cheyenne and Crow, live south and southwest of Colstrip and near Hardin where a new coal-fired power plant was recently built, so there might be some environmental justice issues from differences in benefits between the four options. One justice issue could include the increased risk to the Crow and Northern Cheyenne tribes of receiving elevated levels of mercury from subsistence fishing from the local rivers under cap and trade. The difference in ecological benefit between the four options is, again not quantified, but could be significant between the EPA cap and trade option and the other options.

One further reason for lower benefits from EPA's cap and trade compared to the other options is the risk from cap and trade of creating a hotspot for mercury in Montana. A hot spot in the context of CAMR would mean areas with higher environmental mercury levels that could adversely affect public health. In the case of CAMR, that means areas in Montana that could remain closer to current mercury emissions than the lower levels set out in the allocations. A disadvantage with cap and trade is that some EGUs may reduce emissions less than under command and control and thus certain regions may experience greater levels of emissions than they would otherwise (whereas other regions may experience less pollution than they otherwise would or greater revenues from selling allowances). This is especially the case in areas with older plants where it is cheaper for those plants to simply buy allowances than to reduce pollution. If enough of these plants are located in the same area/airshed, then hotspots can develop where there is significantly more mercury than there would be under command and control. These emissions may continue to have adverse health impacts within the local area, while other areas reduce their burden (EPA, 2005).

While it is clear that EPA's cap and trade program would likely result in the least benefits of all the options, there is a caveat to this. Putting strict emission limits on EGUs can limit the innovation incentive of firms to lower their emissions further over time beyond CAMR. Under a "No Trading" rule not allowing the selling of allowances, Montana EGUs would not have any incentive to lower their emissions in the future below what is required by CAMR. Participation in EPA's cap and trade program, could result in incentives for EGUs to find more effective emission control technologies (in terms of allowance savings), although evidence supporting that is lacking. EPA states that a flexible trading system would allow cost-saving synergies with existing pollution controls (SO_2, NO_x) that already control some mercury. EPA also argues that their proposed trading program would, among other things, reduce the administrative burdens on both EPA and the states and would assure national consistency (EPA, 2004 and EPA, 2005).

3.2.4 Summary of the Benefits from the Four Options

In summary, the benefits, benefit differences and their estimated magnitudes from the four options are the following:

	EPA's Cap and Trade	DEQ's Proposed Rule	Noticed Rule	No Trading Rule
Measurable, monetary Human Health benefits of reducing mercury: Estimated monetary benefits of higher IQ and improved cardiovascular health in men	\$68,000 to \$257,000 in annual benefits. This is \$28,000 to \$218,000 less annually than the No Trade option due to greater Hg emissions.	Same as or slightly lower benefits than No Trading option, due to possibility of new EGU Hg sources increasing Hg levels.	Same as or slightly lower benefits than No Trading option, due to possibility of new EGU Hg sources increasing Hg levels.	\$135,000 to \$286,000 annually from higher IQ levels in Montana, and possibly parts of Wyoming, South Dakota, and North Dakota.
Qualitative (non-measurable or	Up to 50% less non-monetary health benefits	Same benefits as No Trade option or a bit	Same benefits as No Trade option or a bit	Greatest non-monetary health benefits—could

non-monetary) health benefits: Neurologic Cardiovascular Genotoxic Immunotoxic	than No Trade option—could be a significant difference.	less over time due to possibility of new EGU sources.	less over time due to possibility of new EGU sources.	be significant.
Ecological benefits	Up to 50% less ecological benefits than No Trade option—could be a significant difference.	Same as No Trade option or a bit less over time due to possibility of new EGU sources. Fabric filter technology combined with a dry scrubber could reduce water and parasitic electricity usage at Colstrip.	Same as No Trade option or a bit less over time due to possibility of new EGU sources. Fabric filter technology combined with a dry scrubber could reduce water usage and parasitic electricity usage at Colstrip.	Greatest ecological benefits to plants, fish, birds and mammals. Fabric filter technology combined with a dry scrubber could reduce water and parasitic electricity usage at Colstrip.
Environmental justice	Potentially less benefit to Native American populations than other options.	Same or close to the same as No Trade Option.	Same or close to the same as No Trade Option	Any mercury reduction could benefit Native Americans more on average than other populations due to subsistence fishing on Crow and Northern Cheyenne reservations.
Other benefits (Agriculture, Recreation, etc.)	Insignificant-better or more fishing, less agricultural Damage.	Insignificant-better or more fishing, less agricultural damage.	Insignificant-better or more fishing, less agricultural damage.	Insignificant-better or more fishing, less agricultural damage.

IV. Costs of the Four Options for Meeting CAMR

4.1 General Costs of CAMR Under all Four Options

The majority of costs to Montana from any of the four mercury reduction options would be to the private electric generation sector. Montana's EGUs are owned mostly by out-of-state companies. The costs would be borne by all existing and future in-state EGUs that would have to install mercury pollution control equipment and/or buy allowances as a result of CAMR. Colstrip would bear the vast majority of those costs due to its size and its age. New EGUs would bear the costs up-front and install the needed mercury emissions controls in the initial construction, possibly saving significant money per pound reduction over older plants. Additionally new EGUs are currently required to install Best Available Control Technology for mercury emission. So these control costs would not be attributable to CAMR.

The amount and costs of control equipment needed to be installed by EGUs, mainly Colstrip, would likely vary between the four options. This is especially the case between the EPA cap and trade option and the other three options with hard emissions limits. In the case of the EPA cap and trade option, EGU costs could also include buying allowances from other EGUs to meet any shortfall of control. In such an "allowance buying case", the additional costs of buying allowances would be more than offset against the savings from lower mercury control costs, due to the reduction in control equipment needed. In newer plants like Rocky Mountain Power in Hardin, the control equipment costs have been borne up front in the initial construction, and are arguably cheaper per pound of reduction as a result than with older plants. In an older plant like Colstrip, the Hg control equipment would have to be retrofitted (or made to work with existing control equipment), and as a result, would cost more per Hg pound control. On the other hand, Colstrip has already recovered the capital cost of its plant, and, therefore, its owners may be in a better financial position to install such equipment.

The direct control costs to EGUs under all four options would include, but are not limited to, capital investments in pollution controls, on-going operating expenses of the pollution controls, and potentially additional fuel expenditures. Other costs would include monitoring and the re-training of some employees. They would also include for existing EGUs, the costs of any necessary modification to existing equipment and other balance of plant impacts. Under all options, the owner or operator of an EGU would be required to monitor mercury emissions, pursuant to the monitoring requirements of CAMR, to demonstrate compliance with the mercury allowance provisions of the cap and trade rule or a mercury emission standard, or any applicable alternative mercury emission limit. Under those requirements, mercury emissions would be determined by continuously collecting mercury emission data from each affected EGU. This would be done by installing and operating a continuous mercury monitoring system (CMMS) or by an appropriate long-term method (e.g., sorbent trap) that can collect a continuous sample of the mercury in the flue gases emitted from the EGU.

Because no jobs are expected to be lost under CAMR and electricity prices are expected to stay approximately the same for Montana customers (per EPA estimate), no significant social costs are expected to occur from CAMR. These conclusions are derived from several sources. In its RIA, EPA concluded that no EGU plants are expected to close or to curtail their performance as a result of the rule and thus no jobs should be lost (U.S. EPA, 2005b, pages 7-6 to 7-9) .[5] EPA also concluded that there should be no significant shift in the fuels currently utilized by U.S. power plants or in the source of these fuels.

EGU mercury pollution control costs likely would not be passed on to Montana electricity customers because under deregulation those customers are paying prices that are now more closely tied to the nationwide market. Thus, market forces are a far greater determinant of electricity rates for Montanans than EGU capital and operating costs as was the case under regulation. Under regulation, EGUs were allowed to recover capital and operating costs and a fair return, so that any increase in such costs could be passed on to consumers. This is no longer the case. Also, under a new deal between Northwestern Energy (Montana's largest electric transmission utility) and PPL-Montana (Montana's largest energy supplier), for part of its default supply energy, Northwestern Energy will pay a set scale for electricity at a slight discount to current market prices that rises in a pre-determined price schedule over time (to approximately match market rates).[6] It is unlikely that any additional mercury control costs will affect that pre-determined price schedule. In terms of Montana-Dakota Utility customers in eastern Montana, it is not known how any of these options might affect prices. Much of that utility's generation is coal fired, so prices could go up by as much as, or more than, the U.S. average, which is estimated at about 0.3% (RIA, 7-11). It is not certain whether the other out-of-state companies that own Colstrip, such as Puget Sound, would pass on these costs to their out-of-state customers. This is not a concern of the Economic Impact Statement. Even if costs were passed on to Montana ratepayers, any increases would likely be insignificant compared with other electricity price determining factors.

In its RIA, EPA predicts the same result. Retail electricity prices for the U.S. are projected by the EPA to increase a small amount with CAMR. By 2020, national retail electricity prices are projected to be roughly 0.3 percent higher with CAMR when compared to existing CAIR regulations (RIA, 7-11)[7]. For the average U.S. residential consumer, EPRI estimates that the rule would add 0.1 cents-0.3 cents per kWh to

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[5] Although the cost numbers are aggregated nationally, applying them to State-specific analyses may overlook some state-specific factors that impact costs. (Meghan Mcginness, EPA, personal communication, April 2006).

[6] NorthWestern Corporation signed a seven-year power purchase agreement ("Agreement") with PPL Montana ("PPLMT"). The Agreement, which takes effect after NorthWestern's current contract with PPLMT expires next year, provides NorthWestern's Montana default supply customers with a source of reliable electricity supply beginning July 1, 2007, at a significant discount to current market prices. The Agreement calls for NorthWestern to initially purchase 325 megawatts to meet more than one-third of its near-term electricity supply requirements. The megawatt hours purchased decline over the seven-year period, allowing NorthWestern to methodically transition its electricity supply mix to more diverse resources (NWE website).

[7] To isolate the impact of CAMR, it's necessary to compare it (Option 1) to CAIR, because CAMR does not exist without having CAIR to build upon (and CAIR is included in Option 1). Because CAIR does affect Montana through changes in coal prices and ultimately electricity prices (and also because of the way CAMR is designed to build on CAIR), it's not possible to evaluate the impact of CAMR without considering CAIR (Mahgan Mcginness, EPA, 2006).

residential bills. If this increase actually applied to Montana consumers, it would translate into a 2.2 to 6.7 percent rise in the electricity price currently paid by Montanans (EPRI, 2005). However, these cost increase numbers are likely too high for Montana. EPA estimates in the RIA that prices in the Mountain Region where Montana is located would actually be 0.4% less under CAMR than they would be under CAIR (the annual SO2 and NO_x caps on the 23 States). This amounts to about 3/100 of a cent decrease per kWh in the Mountain Region, according to the RIA (EPA, 2005b). In another analysis, the EPA estimates increases in U.S. electricity production costs for different types of mercury controlling technology that range from 0-0.3 cents per kWh for powdered activated carbon to 0.32-1.23 cents per kWh for multi-pollutant controls (EPA, 2003). Taking all the studies and Montana's current electricity supply situation into account, changes in electricity prices to Montana consumers are expected to be minimal under any of the four mercury options.

New EGUs coming into Montana in the future would bear the additional costs of buying allowances each year (if their emissions would cause Montana mercury emissions to exceed the 298 lb. cap) to enter the market under EPA's cap and trade and DEQ's rule. Or, they would pay to offset emissions somewhere else in the state under the Noticed rule after 2015 and No Trading rule. That "somewhere else" would be at another Montana EGU. This additional cost could have a very significant effect on the feasibility of new EGUs entering the Montana market, if those costs caused one or more of them to not be built, or to build to a smaller scale. The costs of a future EGU not being built or downsizing would include foregone future jobs, tax revenues and profit.[8] This could also affect coal gasification plants interested in producing 25 MW or more of electricity (but not those plants just wanting to make petroleum products), and thus falling under CAMR. New EGUs buying allowances on the market under EPA's cap and trade rule or under DEQ's proposed rule likely would be feasible for a new EGU and not cause it a lot of problems. On the other hand, paying for mercury reduction offsets at another EGU could be an issue, especially if one existing EGU, such as Colstrip, has most of the existing allowances. This will be discussed further below.

There may be additional unquantified costs of transitioning to CAMR, such as the costs associated with the retirement of smaller or less efficient electricity generating units (not likely in Montana), and employment shifts as workers are retrained at the same company or re-employed elsewhere in the economy.

4.2 Important Cost Numbers

There are several important cost numbers to discuss before beginning the cost comparison among the four options. The first is that, according to testimony by Gordon Criswell of PPL-Montana (during the June 1, 2006, BER mercury rule public hearing in Billings), it would cost Colstrip about $250-500 million to achieve the 0.9 lb/TBtu standard, using the most conservative (highest) cost numbers available. PPL stated that Colstrip would need to install an expensive technology known as a fabric filter baghouse

[8] Future jobs and income foregone are not economic activities that are currently happening, so those future costs are not real at this time—only subjects of speculation regarding what could happen.

to achieve the 0.9 lb/TBtu standard (versus merely tweaking its current system or adding less expensive control technology). PPL-Montana has stated, and has argued in a commissioned study by NERA Economic Consulting (NERA, 2006) that it would cost PPL much less to achieve a slightly lower percentage of control than what is required under the three hard emissions limit options (e.g. a slightly higher mercury output than 0.9 lbs/TBtu). Using the low end of these conservative and worst-case numbers, the $250 million number is assumed as an initial capital cost to Colstrip for the three options under which an emission limit must be met. The low end of the $250-500 million is used because the $250-500 is already a very conservative, worst case cost range that may be higher than the actual costs of mercury control for Colstrip (especially if better control technology is available in the near future).

The second important cost number is derived from EPA's RIA. In its RIA, EPA estimated a figure of almost $30,100 in marginal cost per pound of mercury reduced for the year 2015, for the average U.S. EGU. (Table 7-8) This amount likely is very conservative (high). EPA estimates that the marginal cost of reducing mercury (in 1999 dollars) would be $23,200 per pound in 2010, $30,100 in 2015, and $39,000 in 2020. The costs go up over time because additional units of mercury reduction are harder to achieve the more that mercury is reduced.[9] These costs are incremental total system costs, which, essentially, should all be related to costs incurred by coal-fired power plants. These are high end numbers due to conservative assumptions (including the assumption of no cost improvements in Hg control technologies over today's mercury technology).[10] These estimated marginal costs will be higher than average costs in individual years, so they will generally overstate costs if multiplied by total Hg reductions. These marginal cost numbers are used for the CELP, Corette and Lewis and Clark EGUs, for which other mercury control cost numbers have not been developed.

The third cost number to note is the expected price of a pound of mercury allowances in the future. EPA estimates that mercury allowances will be in the neighborhood of $30,000 a pound in the foreseeable future. The Energy and Environmental Research Center (EERC) has estimated costs for some mercury control technologies at $25,000 a pound per year. That price may drop significantly by 2010 or later. Both $25,000 and $35,000 are used as conservative long-term figures for future allowance prices per pound of mercury. Market prices of allowances are determined through transactions between

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[9] EPA used the Integrated Planning Model (IPM), developed by ICF Consulting, to conduct its analysis. IPM is a dynamic linear programming model that can be used to examine air pollution control policies for Hg, SO_2, and NO_x throughout the contiguous United States, for the entire power system. Using IPM, EPA modeled the cost and emissions impacts of three Hg control options, to aid in its decision for the final CAMR. The economic modeling presented has been developed for specific analyses of the power sector. As a result, EPA has used discount rates in IPM that are appropriate for the various types of investments and other costs that the power sector incurs (EPA RIA, page 7-1, 2005). EPA believes that the annual private compliance costs that have been estimated are more likely to overstate the future annual compliance costs that industry will incur, rather than understate those costs (EPA RIA, page 7-16 and 7-17, 2005).

[10] Using sorbent technology, EPA estimates that marginal costs could be as low as $11,800, $15,300 and $19,900. Several other assumptions, including an earlier emissions cap and using EIA assumptions for natural gas prices and electric growth raise these three costs up to levels as high as $29,000, $37,600 and $48,700.

emitters, rather than by central authorities. These prices are determined by the amount of pollution reduction targeted under emissions caps, and the incremental costs of controlling additional units of emissions. Generally, the prices of allowances are higher in jurisdictions with more restrictive emissions limits,[11] because the values of allowances reflect the local cost of reducing emissions (EPA, 2005).

The Hardin Generating Station and Roundup Power Project (not yet built) permits require installation of Activated Carbon Injection (or its equivalent as may be approved by the Department) for mercury control, based on Montana's Best Available Control Technology (BACT) requirement. It is assumed that the Highwood Generating Station, currently involved in the air permitting process, will have similar requirements. It has not been conclusively demonstrated that Activated Carbon Injection will meet the 0.9lbs/Tbtu emissions limit. Some initial tests indicate that up to 90% of mercury emissions may be controlled by this technology, which would more than meet the emissions limit.

4.3 Comparing the Costs of the Four Options

Costs of controlling mercury will include initial capital costs, amortized over time, and operating costs that occur in each year. For that reason, EGU costs are estimated in this analysis over a forty-year period, 2010-2050, using the standard annual discount rate of 5%. In the case of a present value calculation, discount rates make distant future costs very low, and going out any further in time beyond 40 years (from the initial CAMR year of 2010) does not significantly change the results. Inflation is not considered in these calculations, and all dollar amounts are reported in current dollars. This is the same process used for the benefit calculations earlier.

4.3.1 Costs of the Baseline-EPA's Cap and Trade Rule

The costs of CAMR to Montana EGUs almost certainly would be less under EPA's cap and trade rule than under the other three options, because cap and trade would allow the owner or operator of each EGU to choose the least costly way of meeting the nation-wide mercury caps specified in CAMR. Economic theory predicts that a flexible cap and trade program, such as EPA's, would achieve overall emissions reductions at a lower cost than the more command and control hard emissions options. EPA recognized this issue in its initial Section 112(n) finding, when it stated: "There is considerable interest in an approach to mercury regulation for power plants that would incorporate economic incentives such as emissions trading. Such an approach can reduce the cost of pollution controls by allowing for least-cost solutions among a universe of facilities that face different control costs. Trading also can allow for a greater level of control overall because it offers the opportunity for greater efficiency in achieving control." (U.S. EPA, 2000)

[11] That is, in areas with emissions limits much lower than historical, unregulated levels of emissions, such as Montana, if Montana adopts such emission limits.

According to economic theory, the costs of pollution control are the lowest for each emitter, and across the entire industry, when the marginal cost of controlling the last unit of pollution is equal at all facilities. Cap and trade allows this to happen (under ideal market conditions) through the market forces of trading, whereas a hard emission limit does not. Thus, the pollution control costs for a hard emission limit system will almost always be higher than under a cap and trade rule because some EGUs will have a higher marginal cost for the last unit of Hg controlled than others. Under a hard cap, if it costs five times more for one EGU to reduce the final pound of mercury than another EGU, then that is what happens.

Through market interactions, emitters can make expenditures to reduce total emissions at lower costs to the entire industry, over one or several periods. For example, the owner of an older facility (such as Colstrip), one that may be expensive to retrofit with pollution control equipment, could control emissions to a point and then buy allowances sold by a newer facility that does not need its entire mercury allowance allotment. Buying those allowances may very well be cheaper for the older facility than the additional levels of control that would otherwise be needed. The EGUs make their own calculations about the costs and benefits of the trade, and the market sets the value of the allowances. No net increase in emissions would result from cap and trade nationwide, because a national cap must be met regardless of what options states choose. However, individual states, and, particularly, localized areas around facilities, could experience more mercury emissions than would occur under a hard emissions cap. At older plants especially, the cost curve of further emissions control can become quite expensive, whereas that same level of control might not be so costly to a new firm. At the other end of the spectrum, trading could induce some EGUs to reduce emissions more than what is required under the initial allowance allocation, and those EGUs would be able to sell excess allowances and make money. An industry might collectively reduce emissions ahead of schedule and bank allowances, perhaps for trades at later times when more expensive pollution control technology might be necessary, as appears will be the case in the current national SO_2 cap and trade program. Appendix C to this analysis provides more economic reasons, as discussed by EPA, as to why cap and trade saves money over hard emission limits.

Cap and trade can also lower costs significantly over strict limits by giving plants flexibility in the face of uncertainty. For example, it is not proven how well certain control technologies such as ACI will actually reduce mercury emissions. This means that any set emission limit on a given plant could be very expensive (or not that expensive) depending on how well that technology works. This means that there is a risk under set emission limits that certain plants might experience significant costs for state of the art control, and still not meet the specific emissions limits. Also, financing may be much harder to come by for new EGUs if it is uncertain whether advanced technologies will meet hard limits under the three hard limit options. This uncertainty could limit or keep some future plants from being built if they don’t get financing.

On the other hand, there are additional costs associated with cap and trade over hard emissions limits. Under a cap and trade rule, monitoring may be more intense than under a hard emission limit. Also, source information management, emissions data reporting, and allowance trading are conducted through on-line systems which could be costly. Some additional training of EGU staff might be required to enter the cap and trade market. These costs would likely be insignificant compared with total control costs.

Calculation

It is hard to know how much mercury would be controlled in Montana, and how many allowances would be purchased under EPA's cap and trade option versus the hard emissions cap of 298 lbs. Thus, it is hard to predict cost differences between the options. An example illustrating this uncertainty was given earlier in the analysis. A study done by NERA Economic Consulting, commissioned by Colstrip, estimated that Colstrip would reduce mercury 77% under cap and trade versus the 83% it would need to reduce under the hard caps of the other three options. A study commissioned by the National Wildlife Federation using the Integrated Planning Model (IPM) developed by EPA, puts the estimate of Colstrip mercury reduction at only 36% under cap and trade (NWF, 2006) and Montana's total reduction at 30%, which would lead to just over 600 lbs. per year of emissions in Montana versus 298 lbs. under the other three rules. Because these are the only data available, a 36% reduction is used as the lower bound for Colstrip mercury reduction under cap and trade and 77% as the upper bound (a figure of 36% to 50% is probably the more realistic range for Colstrip reduction under cap and trade). Including the other EGUs, this translates into about 350 to 600 lbs. per year of mercury emissions under cap and trade versus 298 lb. under the other three options.

The following two cap and trade scenarios for Montana EGUs focus mainly on Colstrip, due to its 90% share of Montana's EGU mercury emissions. The first uses the NERA results and the second uses the National Wildlife Federation results and EPA data. Because it is unlikely that Colstrip would simply buy of its allowances and not control mercury at all, that option is not considered. Over 20 years or so, the purchase of allowances only with no mercury control would likely create costs that are at least as high for Colstrip as the $250 million figure for fabric filter baghouse technology, so that option would not likely occur. That calculation is found in the footnote below.[12]

[12] The assumption here is Montana EGUs keep emitting mercury at current levels (they install no new control technology) and they buy allowances to stay in compliance. Assuming that Colstrip has to buy about 317 lbs. of allowances (947 lbs. currently emitted minus 630 lbs. default EPA cap and trade allowance allocation) per year from 2010 until 2017, and those allowances cost $25,000 per lb., that would be a cost to Colstrip of $7.9 million per year starting in 2010.   Colstrip would have to buy 693 lbs. worth of allowances (947 lbs currently emitted minus 254 lbs. default EPA cap and trade allowance allocation) from 2018 on. This would cost $17.3 million per year (693 x $25,000) from 2018 on. Using a standard discount rate of 5% per year starting in 2010, the net present value (the "present" being 2010) total cost to Colstrip from 2010-2050 would be about $336 million. Corette, CELP and Lewis and Clark would have to buy about 23 lbs. of emission allowances per year from 2010-2017, and 72 lbs. of emission allowances per year after that at a cost of $25,000 per lb. That is $0.6 million per year up to 2017 and $1.8 million per year from 2018 on. The total cost over 40 years (2010-2050) for those three EGUs would be $33.2 million. It is assumed that RMP and SME would meet standards upon commencement of operation without having to install additional controls or buy allowances under cap and trade. So, the total net present value cost to existing Montana EGUs of just buying allowances (without any mercury control) would be about $370 million from 2010-2050. This amount would be greater if allowance prices were higher. Thus, this buying

Scenario 1-NERA Study Results: PPL has documented in a study done by NERA that, under the EPA cap and trade scenario, it would choose to reduce total mercury emissions at the Colstrip EGU to 243 lbs per year in 2010 and 207 lbs. per year in 2015. These numbers are fairly close to the DEQ limits, under which Colstrip would be able to emit about 176 lbs. total per year starting in 2018. Under the DEQ proposal, PPL would not be allowed to buy allowances to demonstrate compliance with the emissions limit starting in 2018, and thus it would not be allowed to exceed the emission limit. Under the EPA cap and trade rule, however, PPL would be able to buy the remaining allowances to make up the difference between its actual control and its initial allocation. Thus, this level of control and buying allowances would be the least costly way of meeting CAMR at the Colstrip EGU. In this way, according to the NERA study, Colstrip would reduce emissions by 77 percent from current levels under cap and trade by 2015 (according to PPL's estimate), as opposed to being required to reduce emissions by 83 percent under the other three options, which include hard emission limits.

According to the report, the 77% reduction under cap and trade would cost about $11,000 per pound per year as of 2015, taking into account the purchase of allowances. For the additional 6% mercury reduction needed under the hard emissions limit options, that cost number would jump up to $67,000 per pound per year in 2015, taking into account allowance trading (NERA, 2006).[13] In air pollution control, small increases in control efficiency can often require a significant change in control methods or equipment. This type of change could cause the significant increases in control costs that NERA estimates. NERA states that from 2010-2014, total mercury control costs at Colstrip would be negative $668,000 per year due to high revenues from selling allowances (which would offset control costs during that time). In other words, PPL actually would make money over that initial time period. The total costs starting in 2015 with tighter standards would be $7.775 million per year, taking into account buying allowances. This leads to a net present value cost of $98.4 million for Colstrip controlling mercury from 2010-2050—much less than PPL's worst case estimate of $250 million for the technology to meet the hard emissions standards. It is impossible to know the costs the other three existing EGUs (not including the SME Highwood Generating Station and Hardin Plant) would experience in controlling some emissions and buying some allowances, so the $33.2 million number from buying all allowances (in footnote 12) is used as an upper bound.

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allowances only scenario is unlikely. Colstrip and the others will almost certainly reduce mercury by some percentage, as it will almost certainly be cheaper to reduce those first pounds of mercury than to simply buy allowances only.

[13] PPL has stated that cost savings from being able to participate in interstate trading are expected to be high largely because interstate trading avoids the need to install very expensive controls at Colstrip to achieve the last few pounds of emission reductions (above and beyond reductions achieved by more cost-effective technology) p. E-2. PPL estimates that the last pounds of reduction at Colstrip would require technology at the margin that is estimated to cost more than $100,000 per pound. Projected allowances are expected to be $35,000 or less. Colstrip estimates an incremental net cost per pound of about $12,000 per pound for reducing mercury down to 207 lbs by 2015 (including the benefits of selling allowance) and an incremental net cost per pound of just under $70,000 for meeting the additional 6% to reach the cap, an 83% reduction.

Adding this $33.2 million for the other three plants to the $98.4 million total for Colstrip results in a total of about $130 million in direct control costs under EPA's cap and trade program for existing Montana EGUs from 2010 to 2050. Insignificant rises in electricity costs, training costs for personnel at EGUs, and other social costs would have to be added to the $130 million figure for a total cost under cap and trade. According to PPL's comments on the BER's mercury rulemaking, this 77% reduction scenario may be unlikely, because, in order to even reach 60-70% without the fabric filter baghouse, everything would have to work perfectly.

Scenario 2: A more likely scenario for Colstrip would be a 37-50% mercury reduction under cap and trade, using a combination of banked credits, modifications to the system, some retrofits, and buying of allowances. Because this cap and trade scenario still would involve PPL choosing its least cost option, the cost number calculated by NERA, $98.4 million, is a best estimate for that cost, and $130 million is the total cost to existing Montana EGUs under cap and trade for the 2010-2050 time period.

4.3.2 Cost of DEQ's Rule with Hard Emission Limits

Under this option, Montana EGUs would be required to reduce mercury emissions down to 0.9lbs/Tbtu, or 2.16 lbs/TBtu for lignite plants, by 2018. Under the DEQ proposal Colstrip would receive the equivalent of 470 lbs of mercury allowances annually between 2010 and 2014. It would receive the equivalent of 176 lbs of mercury allowances annually after 2014. Under the DEQ proposal, PPL would not be allowed to buy allowances to demonstrate compliance with the emissions limit starting in 2018 (if Colstrip had an AEL prior 2018, PPL could buy allowances to comply with that limit). It would not be allowed to exceed an emission limit.

As stated above, the lower end of the PPL-Montana estimated $250-500 million is used as a cost for Colstrip to meet the 0.9 lb/TBtu standard under the worst case scenario. PPL has stated that it would cost much less if it is required to meet a lower percentage of control. This is a cost difference of about $150 million (for the 2010-2050 time period) for Colstrip between cap and trade and the hard emission limits (using NERA's $98 million figure for costs under cap and trade). That may be an overestimation due to use of different studies, and differences in assumptions between those studies, so this $150 million difference is treated as an upper bound. If the cost of Colstrip meeting the hard emission limit is closer to $500 million, then the $150 million difference in cost number could be an underestimate as well. The actual cost difference between scenarios is probably lower. PPL-Montana likely is in a better position than it was prior to deregulation in 1997 to bear higher costs due to the fact that it is charging higher electricity rates to Montanans than the rates that were charged under regulation. This is a point to bear in mind when trying to determine the magnitude of this effect on Montana's largest energy supplier.

For the other three EGUs, using a $30,100 per pound marginal cost control number given by EPA for the year 2015, the total cost of 72 lbs. control is estimated at $2.8 million per year or about $49 million in net present value from 2010-2050. So, total costs under DEQ's rule would be about $300 million for Montana EGUs as an upper bound. Some of those costs could be offset if mercury emissions were lowered beyond the 0.9 limit. Assuming that 10-20% of the time, Colstrip and other existing plants are running below capacity or are shut down, some allowances could be sold or banked. The four existing EGUs (not including the Hardin Generating Station, the Roundup Power Project, and the Highwood Generating Station) would get 205 lbs of allowances per year at 0.9 lbs/TBtu and 2.16 lbs/TBtu, so 10-20 allowances per year (5-10% of the total) sold to other plants would generate about $250,000 to $500,000 per year in revenue to offset the costs.

Another way to calculate the cost difference to Colstrip between EPA's cap and trade option and DEQ's proposed rule is to use the NERA study calculated difference in cost between these two options (stated directly in that study). NERA estimated that, in 2010, cap and trade would cost Colstrip $4.8 million annually less than DEQ's proposed rule. NERA estimated that in 2015, cap and trade would cost $3.6 million less annually than DEQ's proposed rule. A net present value calculation results in a difference of $69 million in cost to Colstrip from 2010-2050, using NERA estimates. The difference between the $250 million dollar figure under hard limits, stated in testimony by PPL, and the $98 million cost calculated by NERA is about $150 million. So, the estimated additional costs to Colstrip under DEQ's proposed rule compared with cap and trade would be in the range of $69-$150 million from 2010-2050. The reason for this large range is that NERA's cost numbers for full mercury control under DEQ's hard limits are different from those presented by PPL in testimony. The difference in costs for the other three plants is the cost difference between EPA cap and trade scenario 2, $31.6 million (using $25,000 for allowances), and DEQ's option, which would be $49 million (using $30,100 for marginal cost). Adding the $18 million difference for the other three EGUs leads to an estimated range of difference in cost of $87-$168 million to Montana EGUs between the EPA cap and trade baseline and DEQ's proposed rule.

4.3.3 Noticed Rule

The cost difference between the Noticed rule and the cap and trade baseline would be the same as calculated under DEQ's proposed rule, or slightly higher. The existing EGUs would not have any allowances to trade after 2015 under the Noticed rule, and thus would not make any money from selling allowances. Perhaps more importantly, new EGUs would have a harder time entering the market after 2015 under the Noticed option than under DEQ's or EPA's options. New EGUs would have to offset mercury emissions elsewhere in Montana as opposed to just buying their emissions on the market using allowances. PPL-Montana and others would have some control over whether a new EGU could enter the market, because that EGU would have to buy offsets from other Montana EGUs (likely Colstrip) to enter the market. Thus, under the Noticed rule after 2015, existing EGUs, especially Colstrip, would have more market power to keep new EGUs out of Montana if they wanted to. New EGUs would at least have up to 2015 to enter under the more favorable condition of having the ability to buy allowances. That would be the major additional cost of the Noticed option over DEQ's rule.

4.3.4 ”No Trading” Rule

The cost difference between the No Trading rule and the cap and trade baseline would be at least as much as calculated for DEQ’s proposed rule, but could be significantly higher. Existing EGUs would not have any allowances to trade, and thus would not make any money from selling allowances. Perhaps more importantly, new EGUs would have a harder time entering the market because they would have to buy offsets from other Montana EGUs to enter. This means that PPL and others would have some control over whether a new EGU could enter the market, because that EGU would have to buy offsets from other Montana EGUs (likely Colstrip) to enter the market. Existing EGUs, especially Colstrip, would have more market power to keep out new future entrants in Montana if they wanted to. That could be a major additional cost to future EGUs over DEQ’s rule. Also, under the No Trading rule, new lignite EGUs would not gain the advantage of less stringent limits. Finally, the No Trading rule would allow AELs, but would not allow AELs that would exceed Montana’s budget, which could prove costly to EGUs in the initial years of CAMR after 2010.

4.4 Summary of Costs

Summary of Costs, 2010-2050 (Net Present Value)

	Baseline-EPA’s Cap and Trade	DEQ’s Proposed Rule	Noticed Rule	“No Trading” Rule
Direct EGU Control Costs (best estimates)	$130 million. Mostly borne by Colstrip owners. Some of that cost could be slightly offset by Montana EGUs selling allowances.	$87-168 million more than under EPA’s cap and trade rule, or about $220-$300 million total. Mostly borne by Colstrip owners. The upper end cost number is likely very high. Some of the cost could be offset by EGUs selling allowances. Also, greater risk of future EGUs not getting financing due to uncertainties about meeting hard Hg limits.	Same as or slightly greater than DEQ’s proposed rule. There would be additional costs on new EGUs after 2015 having to pay for offsets—might preclude new sources from locating in MT. Also, greater risk of not getting financing due to uncertainties about meeting hard Hg limits.	Same as or greater than under DEQ’s proposed rule. There would be additional costs on new EGUs having to pay for offsets--might preclude new sources from locating in MT. Also, greater risk of not getting financing due to uncertainties about meeting hard Hg limits.
Increased electricity	Likely near zero.	Likely near zero. Potential for	Likely near zero. Potential	Likely near zero. Potential

prices to Montanans		slightly higher prices than under EPA's cap and trade rule.	for slightly higher prices than under EPA's cap and trade rule.	for slightly higher prices than under EPA's cap and trade rule.
Jobs	No jobs lost in Montana. There could be some employment shifts as workers are retrained at the same company or re-employed elsewhere in the economy.	Same.	Same.	Same.
Other costs/ Unquantified costs	Imperfect information to make cap and trade work perfectly. Imperfect trading market Transaction costs of training workers. Monitoring. Reporting.	Monitoring, worker training. Fabric filter technology combined with a dry scrubber could reduce electricity costs and water pumping costs at Colstrip.	Monitoring, worker training. Fabric filter technology combined with a dry scrubber could reduce electricity costs and water pumping costs at Colstrip.	Monitoring, worker training. Fabric filter technology combined with a dry scrubber could reduce electricity costs and water pumping costs at Colstrip.

Citations:

DEQ, 2006. DEQ's mercury emissions rule (March 2006) is found at http://www.deq.mt.gov/ber/2006_Agendas/Mar06/IIIB1NoticePubHrgPropAmendAdopt.pdf

EPRI. EPRI Journal, "Mercury Control for Coal-Fired Power Plants", Summer 2005.

NERA. NERA Economic Consulting. "An Evaluation and Empirical Analysis of a National Cap and Trade Program to Reduce Montana Mercury Emissions". Prepared for PPL Montana, LLC on Behalf of the Colstrip SES Owners, 2006.

NESCAUM, 2005. Northeast States for Coordinated Air Use Management. "Economic Valuation of Human Health Benefits of Controlling Mercury Emissions from U.S. Coal-

Fired Power Plants", February 2005. Prepared by Glenn Rice (ScD Candidate) and James K. Hammitt (Director), Harvard Center for Risk Analysis.

NWF, 2006. National Wildlife Federation. "The Impact of Federal Clean Air Rules on Mercury Emissions at U.S. Coal-Fired Power Plants" by Mary Jo Krolewski, July 2006.

NWE website. Northwestern Energy website: http://www.northwesternenergy.com/AboutUs/newsroom/display_news.aspx?M=1611&I=169&document_id=553.

U.S. EIA. U.S. Energy Information Administration. U.S. Department of Energy. "Net Generation from Coal by State by Sector", Electric Power Monthly with data for December 2005 at http://www.eia.doe.gov.

U.S. EPA, 2000. Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units, FR 65 at 79830 and 65 FR 79831, at http://www.epa.gov/EPA-AIR/2000/December/Day-20/a32395.htm.

U.S. EPA, 2003. U.S. Environmental Protection Agency, Office of Research and Development, "Performance and Cost of Mercury and Multipollutant Emission Control Technology Applications on Electric Utility Boilers", EPA-600, R-03-110, prepared by National Risk Management Research LaboratoryResearch Triangle Park, NC 27711.

U.S. EPA, 2004. Federal Register, Vol. 69, No. 20 / Friday, January 30, 2004, 40 CFR Parts 60 and 63, at http://www.epa.gov/ttn/atw/utility/frnotice_013003.pdf.

U.S. EPA, 2005. Federal Register, Vol. 70, No. 208 / Friday, October 28, 2005, Proposed Rules, Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Utility Steam Generating Units From the Section 112(c) List: Reconsideration, at http://www.epa.gov/ttn/atw/utility/fr18my05.pdf.

U.S. EPA, 2005b, RIA. *Regulatory Impact Analysis of the Clean Air, Mercury Rule--Final Report*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Strategies and Standards Division, Innovative Strategies and Economics Group, Research Triangle Park, N.C. 27711, March 2005.

U.S. EPA, Webpage. On-line mercury information available at http://www.epa.gov/mercury

Appendix A-Issues Addressed Pursuant to Section 2-4-405, MCA.

This economic impact statement provides the following information specified in Section 2-4-405, MCA:

(a) a description of the classes of persons who will be affected by the proposed rule, including classes that will bear the costs of the proposed rule and classes that will benefit from the proposed rule;

The costs of the mercury rule under all four options, and the additional costs of the three proposed options with hard emissions limits, will fall almost exclusively on Montana EGUs. The owners of the EGUs may pass a small amount of these costs on to electricity consumers in and outside of Montana, but any electric rate increases should be insignificant compared to other determinants of electricity price borne over time by ratepayers. Because electricity rates are deregulated, and because of a recent deal between PPL-Montana and Northwestern Energy, Montana ratepayers would not be expected to bear any significant increased costs in the form of increased rates as a result of CAMR. Colstrip would bear the vast majority of costs from any of the mercury rules adopted (including additional costs from the three more expensive options), and thus the owners of Colstrip would experience lower profits, all else being equal. The owners of Colstrip are mostly out-of-state companies and include PPL-Montana (an in-state company), Puget Sound Power and Light, Portland General Electric, Avista, Pacific Corp, and Northwestern Energy. The owners of the other EGUs include Colstrip Energy Partnerships and Montana-Dakota Utilities.

The benefits of the mercury rule would be felt by those who live downwind and near Montana's EGUs—mostly in Eastern Montana, Wyoming and in the Dakotas. Fishermen in the same, or perhaps an even larger area, likely would benefit from fewer mercury fish advisories. Fish, birds and mammals in the mercury deposition area would also experience benefits of fewer toxic mercury episodes.

Two tribes in Montana, the Northern Cheyenne and Crow, live south and southwest of Colstrip and near Hardin where a new coal-fired plant was recently built, so there might be some environmental justice issues from differences in benefits between the four options.

(b) a description of the probable economic impact of the proposed rule upon affected classes of persons, including but not limited to providers of services under contracts with the state, and quantifying, to the extent practicable, that impact;

No EGUs are expected to close down as a result of any of the proposed mercury rules, nor are any jobs expected to be lost (although some jobs could change through re-training). There is the possibility of short-term construction jobs from installation of additional air pollution control equipment and possible additional jobs operating air pollution control or monitoring equipment. The owners of Colstrip will bear significant additional costs as a result of any of the rules, and possibly much higher costs under the three proposed rules with hard emission limits than under EPA's cap and trade rule. This would translate into lower profits, although the impact of such a decrease in profits to the companies that own Colstrip likely would be mitigated due to: the fact that most or all of the initial capital costs for Colstrip have been paid; and the fact that PPL-Montana is receiving higher rates for its electricity under deregulation. Electricity consumers are not expected to be significantly affected by this rule. Some EGU workers might have to be retrained or re-assigned.

Non-monetary benefits could have a significant beneficial economic effect on human health and parts of the economy related to the environment. Health costs could go down for affected populations, which is a benefit. Ecological cleanup costs might be reduced for affected areas. Fishing advisories might be lifted over time, leading to increased and better quality fishing as well as an insignificantly greater amount of tourist related revenues. More protective rules could decrease health risk to the Crow and Northern Cheyenne tribes involved in subsistence fishing from the local rivers.

(c) the probable costs to the agency and to any other agency of the implementation and enforcement of the proposed rule and any anticipated effect on state revenue;

Implementation and compliance/enforcement costs to the DEQ for the mercury rule will be minimal. If EPA's cap and trade was adopted, EPA would implement virtually all trading provisions of its cap and trade rule and DEQ's implementation costs for this option would be limited to monitoring, record keeping, and reporting. Under the other three emissions control options, implementation (permitting) activities would include processing an estimated 8 permit modifications and compliance costs would primarily consist of review of mercury emission reports. These activities would be accomplished with existing DEQ staff.

(d) an analysis comparing the costs and benefits of the proposed rule to the costs and benefits of inaction;

Total monetary costs of CAMR in Montana and cost differences between the four options would likely be significantly greater than total monetary benefits of CAMR and benefit differences. See the main body of this analysis.

(e) an analysis that determines whether there are less costly or less intrusive methods for achieving the purpose of the proposed rule;

The purpose of the proposed mercury rule is two-fold. The first purpose is merely to meet the minimum requirements of CAMR. As described in the body of the analysis, EPA's default cap and trade rule is the least costly and intrusive method of achieving this purpose of the rule. The other purpose of the proposed rule is to reduce mercury emissions in Montana in order to mitigate potential health and environmental impacts from localized deposition of mercury from EGUs. Because CAMR focuses only on national reductions, it does not guarantee mercury emission reductions in Montana, using the EPA cap and trade model. The DEQ proposed option achieves the rule's purpose by requiring mercury emission reductions from existing and currently permitted EGUs consistent with the EPA's goals for nation-wide reductions. The Noticed rule and No Trading option achieve the rule's purpose by adopting a state-wide mercury emissions cap of 298 lbs. The DEQ proposed alternative, and to a lesser extent the Noticed rule, would be less costly alternatives for achieving the rule's purpose than the No Trade rule, because allowing trading of allowances could generate revenue to offset costs of control, and would be easier on new EGUs entering Montana's market.

(f) an analysis of any alternative methods for achieving the purpose of the proposed rule that were seriously considered by the agency and the reasons why they were rejected in favor of the proposed rule;

The analysis includes discussions of several regulatory options that are being considered by the BER. The response to comments included in the final rule adoption MAR notice will discuss the reasons the Board chose the final rule.

(g) a determination as to whether the proposed rule represents an efficient allocation of public and private resources;

EPA's cap and trade option, the DEQ proposed alternative, and to a lesser extent the Noticed rule, would be less costly alternatives for achieving the rule's purpose, because allowing trading of allowances could generate revenue to offset costs of control. Thus, they represent an efficient allocation of public and private resources.

(h) a quantification or description of the data upon which subsections (1)(a) through (1)(g) are based and an explanation of how the data was gathered;

DEQ's mercury emissions rule: Gathered basic information about CAMR and DEQ's proposed rule.

EPA mercury info http://www.epa.gov/mercury: Gathered basic information about mercury and some of the health benefits of reducing mercury.

EPA, 2004. Federal Register, Vol. 69, No. 20 / Friday, January 30, 2004, 40 CFR Parts 60 and 63, page 2, at http://www.epa.gov/ttn/atw/utility/frnotice_013003.pdf:. Gathered information on EPA's historical regulation of mercury, the relationship between EGUs and mercury, the regulation of EGUs for mercury, and the relationship of that regulation with other air quality laws.

EPA, 2005, Federal Register, Vol. 70, No. 208 / Friday, October 28, 2005 / Proposed Rules, Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Utility Steam Generating Units From the Section 112(c) List: Reconsideration http://www.epa.gov/ttn/atw/utility/fr18my05.pdf: Gathered general and specific information about CAMR and its requirements, EPA's cap and trade program, and why EPA prefers cap and trade.

EPA, Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units, Federal Register, Vol. 65, at 79830 and 65 Federal Register at 79831, http://www.epa.gov/EPA-AIR/2000/December/Day-20/a32395.htm: Basic information on mercury control at EGUs.

EPA, RIA, Regulatory Impact Analysis of the Clean Air Mercury Rule--Final Report, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Strategies and Standards Division, Innovative Strategies and Economics Group, Research Triangle Park, N.C. 27711: Gathered specific economics information developed by EPA on the costs and benefits of CAMR. Information included monetary and non-monetary health benefits, and a detailed discussed of EGU marginal costs for mercury reduction and electricity ratepayers costs.

EPRI, 2005. EPRI Journal, "Mercury Control for Coal-Fired Power Plants", Summer 2005: Potential increases in consumer electricity rates from controlling mercury.

NERA Economic Consulting. "An Evaluation and Empirical Analysis of a National Cap and Trade Program to Reduce Montana Mercury Emissions". Prepared for PPL-Montana, LLC on Behalf of the Colstrip SES Owners, 2006: Specific information given on the differences in costs and mercury emissions at Colstrip between EPA's cap and trade rule and a hard emissions cap rule.

NESCAUM, 2005. Gathered benefits estimates for reducing mercury emissions.

NWF, 2006. National Wildlife Federation. "The Impact of Federal Clean Air Rules on Mercury Emissions at U.S. Coal-Fired Power Plants" by Mary Jo Krolewski, July 2006. Gathered estimates on mercury emissions reductions in Montana under EPA's cap and trade program.

NWE website. Gathered details about recent agreement between NWE and PPL-Montana.

U.S. EIA, Net Generation from Coal by State by Sector, *Electric Power Monthly with Data for December 2005.* Gathered electricity generation data.

Appendix B-EPA's Estimate of Monetary Benefits of Lowering Mercury Emissions

In Chapter 10 of EPA's Regulatory Impact Analysis of the Clean Air Mercury Rule--Final Report (RIA), the monetary benefits of lowering mercury emissions via the Clean Air Mercury Rule (CAMR) are estimated. The monetary benefits are estimated for one major type of mercury impact—the benefits of higher IQs in children from lower emissions. The higher IQ benefits are measured for the 37 eastern states in the U.S., which does not include Montana or the U.S. West. The total benefits from CAMR of higher IQ levels in children are less than $5 million a year for all 37 states, and the benefit for all mercury reductions from EPA clean-air rules (including CAIR) is around $50 million a year[14]. EPA concludes in the RIA that costs to industry would be about $750 million a year and $3.9 billion total net present value from 2007-2025. Thus, the monetary costs of the CAMR were found to greatly outweigh the monetary benefits for the entire U.S.

The benefit numbers estimate does not include non-monetary benefits to human health, recreation, ecosystem quality, and agriculture. The costs do not include certain transaction costs of compliance with CAMR. A Harvard University study paid for by EPA, and co-authored by an EPA scientist and peer-reviewed by two other EPA scientists, has reached an entirely different conclusion on monetary benefits. That analysis estimated health benefits to be 100 times greater than the benefits estimated by EPA, in large part due to the fact that it took into account the effects of lower mercury levels in ocean fish as opposed to only fresh water fish. The EPA did not acknowledge that study.

The monetary benefits that EPA found (from higher IQ levels) do not include CAMR benefits to freshwater fishing in the U.S. West (13 states) as well as to commercial fishing in the Pacific (which produces 68% of the commercial fish supply for the U.S.).

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[14] The basic methodology used in Section 10 of the RIA is to project the change in IQ of a population of children due to mercury exposure *in utero*. The analysis first examines impacts on the general population of children of freshwater fishers. It then considers much smaller populations that consume greater amounts of fish than the general population, including subsistence fishers, certain Native Americans, and Asian Americans. The exposure is based on consumption of fish by pregnant women. The mercury in the fish is due in part to atmospheric deposition of mercury from power plants. A monetary value is placed on incremental loss of IQ by these children. The incremental reduction in exposure due to mercury emission reductions from power plants is then applied to this methodology to calculate the improvement in IQ and the monetary value of that improvement attributable to the emissions reduction. The study examines only consumption of freshwater fish because the analysis indicates that these are the only fish significantly impacted by U.S. power plants.

A typical child of freshwater fishers lost approximately 0.06 - 0.07 IQ points due to mercury exposure in 2001, depending on the analytical approach. Average IQ is, by definition, 100 points. In short, the overall impact of mercury on the IQ of children in the general population is relatively small, less than one-thousandth of a normal IQ (Normal = 100). It is found in the study that commercial fish consumption constitutes a large portion of exposure to methylmercury. Benefit values were then estimated for higher IQ levels in these populations, but cannot be used for Montana where much less benefit overall is assumed by the EPA.

The reason for the eastern U.S. focus stated in the RIA is that the air quality modeling showed that the largest change in deposition from U.S. power plant emissions of mercury will occur in the eastern half of the U.S., so that the unquantified benefits for the western portion of the U.S. are expected to be quite small. This implies that the IQ-related benefits in Montana from CAMR, regardless of which rule is adopted, would be small. Thus, the monetary benefits estimated in the RIA cannot be used for, or transferred to, Montana. Lacking other information, there is no good way for the DEQ to estimate human-related benefits for Montana.

Appendix C—Advantages of Cap and Trade According to EPA

Six principal advantages of market-based systems have been recognized by the EPA in the Federal Register (Vol. 70, No. 208 / Friday, October 28, 2005 / Proposed Rules, Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Utility Steam Generating Units). The advantages that apply to this analysis include that cap and trade allows for the potential to create incentives for early emission reductions, or emissions reductions beyond those required by regulations; results in a reduced cost of compliance for individual sources and the regulated community in general; promotes the innovation and continued evolution of production and pollution control technology; and increases flexibility for the regulated community. In other words, under the arguments of EPA and standard economic theory, by creating a market for mercury, as opposed to setting a hard emission limit, the incentive to reduce emissions will continue to increase. As more EGUs enter the market over time, with the number of allowances staying constant over time, the allowance price should go up (all else equal). This means that buying the right to emit a pound of mercury becomes more expensive, so that controlling emissions becomes more attractive over time.

The benefits from cap and trade result primarily from the flexibility in compliance options available to mercury sources and the monetary reward associated with avoided emissions in a market-based system. The system allows for various compliance options, with each firm determining what option works best given certain costs, such as fuel costs or costs of pollution controls. For example, in addition to the pollution control options discussed above, companies can comply with cap and trade programs through more efficient use of the generating fleet to take advantage of generating sources that emit less and run more efficiently, commonly referred to as dispatch changes. By shifting generation to these more efficient units, the power sector is reducing the cost of compliance because there is a cost to pollute. In other words, firms have economic incentives to achieve emissions reductions where they are cheapest. Tradable emission allowances allow market forces to balance the costs and benefits of operating different facilities and reward operators for reducing emissions below their respective permits. In this way, emissions are reduced in the cheapest way possible, as determined by each emitter. Eventually, market forces bring the cost of pollution control into equilibrium with trading, whereas abatement technology costs will be spread unevenly under set emissions limits (EPA RIA, page 6-7, 2005).

A trading approach is better suited to stimulating development and adoption of new technologies, and a cap and trade system provides a market incentive for the development and use of cost-effective technology to reduce Hg emissions. An emission limit approach provides no such market incentive, so plants do not have an incentive to reduce emissions below the required level. Additionally, the ability to bank unused allowances for future use leads to early reductions of Hg emissions. A trading approach is forward-looking in its assessment of technology, in that it provides a continuous incentive for firms to innovate and develop more cost-effective technologies to reduce Hg emissions. Cap and trade might also allow plants to be less risk averse, because in a high mercury emission year, a plant could simply buy emissions.

Also, from a capital planning perspective, a trading approach permits utilities to make a much more rational investment in emissions control than a traditional emission limit approach. Utility investments in reducing criteria air pollutants (particulate matter, sulfur dioxide and oxides of nitrogen) provide a ‘‘co-benefit’’ of Hg control because some forms of Hg (especially those that are deposited nearest plants) are controlled by the same technologies used to control criteria pollutants. The exact size of this co-benefit is not known. In any event, given the likelihood of co-benefits, it makes good economic sense for utilities to coordinate control of criteria air pollutants—especially those needed to achieve the new air quality standards for fine particulate matter and ozone— with their capital investments aimed at reducing Hg emissions. The statutory deadlines for a Hg Maximum Achievable Control Technology (MACT) under Section 112 of the Federal Clean Air Act do not permit this rational sequence of investments. Under a tradable emissions system, cleaner operators have a competitive advantage over others, because they can earn additional revenue from trading unused allowances (unless the initial distribution of allowances is biased against cleaner firms).